THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. FEBRUARY 1, 1894. CHICAGO, ILL. NUMBER 5.

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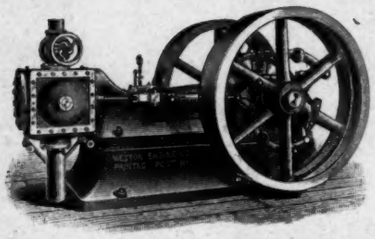

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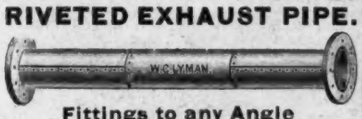

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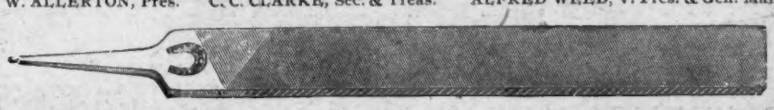

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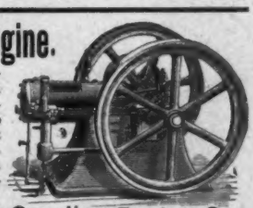

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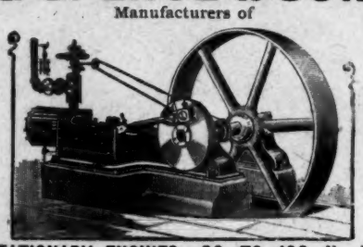

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THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. FEBRUARY 1, 1894. CHICAGO, ILL. NUMBER 5.

THE WEEK IN IRON CIRCLES.

GENERAL FEATURES.

The improvement in the iron trade shown in increasing sales has continued the past week, and there is a more general disposition to concede betterment. Prices, however, are just as low as in the week preceding. It may be that the hopes of sellers have some influence upon their judgment, but the belief is expressed that some of the buying seen in the last 10 days is the result of the conviction that the depth of the market has been reached, and that the first signs of hardening prices may be looked for very soon. It would be difficult to be too conservative in making any statement on the subject of prices, but there is ground somewhere on which the market will rest before any upward movement ensues, and indications multiply that such a level has been reached. Pittsburg and Eastern markets report an increased tonnage in the week just ended, both in raw and in finished material. Pig iron has shown only slightly increased inquiry, but in soft steel billets Eastern inquiry has led to several good-sized sales at Pittsburg, ranging from 1,000 to 4,000 tons. The price was in the neighborhood of $15.50, but there is a report that $15.25 was touched in one transaction. It is believed that billets are lower in proportion than other material, and that this department of the market will be one of the first to recover. Recent pig iron transactions have included liberal buying by pipe foundries, chiefly in the East. Stove foundries show a trifle more activity, and car wheel iron has been in some demand, but only in carloads, as against round lots last year. Charcoal iron is being called for to a somewhat greater extent for malleable purposes, but 200 tons is a large sale. Production has been signally curtailed in charcoal grades, and any change in the market is likely to be in the direction of better prices. The jobbing foundry trade still waits for distinct signs of improvement, and meantime buys in the long prevalent small lot way. Rolling mills and steel plants are struggling for work in the same spirited way, and the increasing consumption of their product has not yet begun to tell in sating the appetites of the price cutters. On the part of some authorities in the trade there is a disposition to think that some of the activity lately noted is due to the strengthening impression that the Wilson bill cannot pass the Senate in anything like the present form, and that with the income tax feature eliminated, there must be a substantial increase in duties in many lines; or that the present session at least will see no change in the McKinley act.

THE CLEVELAND OUTLOOK.

Some inquiries about ore are coming in from intending purchasers, with a view to sounding the intentions of selling firms. The ideas of these inquirers are quite bearish, and there is at this stage of the negotiations about 50 cents a ton between the figures of furnacemen and ore firms. It is pretty well assured that the purchases of the Carnegie Steel Co. will include 20 to 25 per cent. of Mesabi ores, about this proportion having been employed in their mixtures in the trials thus far made, and other prominent buyers will take Mesabi ores in something like that proportion—in some instances, perhaps, a greater amount. It has already been intimated by buyers that they have had tenders of Mesabi ores at $2.50, but it is a question whether the best ores of the new range have been offered at that figure, sellers affirming that $2.75 is the price at which their No. 1 ores will be held. Standard Gogebic and Marquette Bessemers, it is affirmed, have not been available thus far at less than $3, or 75 cents below last year's early sales. There is a general waiting for developments in regard to lake freights. Shippers made charters from the head of the lake in the early part of last season at $1, and some of them are counting on an 85-cent rate in '94; but much will depend on the success vesselmen have in their effort for the elimination of a share of the tonnage. All calculations by ore sellers at any of the figures named above for Bessemers are based upon the low labor cost at which some producers are now accumulating moderate stockpiles. Any development of activity in the demand for ore that would lead the miners to stand for better wages is a contingency not covered in present estimates, nor is the other possibility of an advance in freight rates beyond the basis of last year. The situation presents a number of complications that make a further wait entirely agreeable to those producers who are not now accumulating ore, and who regard the time of lowest prices in all lines of material as least opportune for closing contracts that are to run a twelve-month, with chances very largely in favor of an upward movement.

Pig Iron. Besemer pig is held at $10, furnace, by the few Valley furnaces that are sellers, though it is known that $10.25, Pittsburg, has been done by furnaces in the Pittsburg district. Foundry iron for shipment eastward out of the Valleys has shown slightly increased activity at $12 and $11 respectively for Nos. 1 and 2. Gray forge moves slowly and the Cleveland basis is still about $9.75. An inquiry is out for a round lot of Bessemer pig, but the figures named are at the very bottom. Brier Hill furnace in the Mahoning Valley is expected to go in at an early day.

Finished Material. The good run of inquiry noted a week ago continues, and while the volume of current business is not greatly increased, indications for the near future are more promising. Bar iron contracts are still exceedingly low, 1.20c at valley mill being the basis of recent transactions. The demand for structural material holds up fairly well, with prices the lowest. The Cleveland Rolling Mill Co.'s plant is active in all departments except the plate mill, the new Bessemer steel plant being put in operation Feb. 1.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

While some of the dealers in iron and steel report the past week as being very dull, others say that it has been a decided improvement over the week previous. Altogether it is probable that in most branches of the trade sales have increased a little in number if not in amounts. More consumers are in the market at present than has been the case for some time past, and while the new buyers are not very numerous, they are sufficiently so as to lend a brighter aspect to the condition of affairs. The rail market has developed nothing new, but one of the elevated roads, it is understood, will come into the market shortly for about 2,000 tons of structural material for a new branch.

PIG IRON.—Misplaced enthusiasm on the part of the compositor made us refer last week to a sale of 2,000 tons of Lake Superior charcoal iron; 200 tons was the amount of the sale. This week little has been done in charcoal iron, though one or two small lots have been placed. A rumor that was current last week that a prominent house had made very low offers of charcoal iron was denied by them in toto. In local coke iron a very fair car load business has been done, and as there are several inquiries in the market for good-sized amounts it is likely that the present week will have a good tonnage to its credit. Southern irons have been quiet, but inquiries are more numerous and a better business is looked for in the near future.

BARS.—A fair business has been done in small lots from store, but no large mill orders have been received. Shipments are being ordered a little more freely on old contracts. Quotations are unchanged at 1.25c to 1.30c for both iron and steel bars, Chicago delivery, but rumors are still heard of very low prices being made on steel.

STRUCTURAL MATERIAL.—It is reported that the Lake Street Elevated Road will be in the market within a few weeks for about 2,000 tons of material for a new branch on the North Side. Aside from this there is nothing new. A fair amount of small orders is being received from day to day. Prices are made as last reported. Beams, 1.65c to 1.70c; angles and plates, 1.60c to 1.65c; tees, 1.75c to 1.80c.

RAILS AND TRACK SUPPLIES.—Nothing new has come up in the local market, and prices are unchanged. Rails, $25 to $27; splice bars, 1.55c to 1.60c; track bolts, 2.55c to 2.60c; spikes, 1.90c to 1.95c.

BILLETS.—The situation is unchanged, and no sales have been made. Quotations are made at $18 to $18.25.

PLATES.—A few orders of fairly large amounts have been received from the boiler trade, and business appears to be in a little better shape. Prices are unchanged. Tank steel, 1.60c to 1.65c; shell steel, 1.80c to 1.85c; flange steel, 2c to 2.10c; firebox steel, 3.75c to 4c; tubes, 70 and 5 per cent discount.

SHEETS.—Trade in black sheets has been rather quiet, only small orders being received. Prices are made at 2.65c to 2.70c, Chicago. Galvanized sheets have been selling rather more freely, with no change in prices, which are 75 and 10 per cent. discount.

MERCHANT STEEL.—Orders for shipments on contracts are being received a little more freely, but no new business of any size has been taken. Quotations are unchanged. Open-hearth spring, 1.90c to 2.05c; machinery, 1.95c to 2.05c; tire, 1.90c to 2.05c; crucible spring, 3.50c; machinery, 4.50c to 4.75c; tool steel, 6½c and upwards.

OLD RAILS AND WHEELS.—Business has been quiet, with only an occasional car load order for old rails, which are valued at about $12 to $13. Old steel rails are held at $7 to $7.50 for short, and $11.50 to $12 for long lengths. Old wheels are quiet, and are quoted nominally at $10 to $10.50.

SCRAP.—Only a very small business has been done, and dealers do not look for any immediate improvement. Quotations are made as follows: No. 1 forge, $10; No. 1 mill, $7; axles, $12; cast borings, $3.50; wrought turnings, $4; axle turnings, $6; mixed steel, $5; coil steel, $7; leaf steel, $8; low tires $8.

GENERAL MARKET RESUME.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. Better things are to be said of the local iron and steel market. Demand has been greater the past week, particularly for soft steel, the principal inquiries coming from the East, though some little steel has been sold in the West. It is recognized that billets are extremely low and buyers are covering requirements in a way that, if continued, would suggest a slight improvement in price. It is plain that a number of mills are not able to get out even at present prices for billets and slabs. There is a slight increase in the demand for raw iron, and inquiries are more numerous. In Bessemer a few sales have been made ranging from 500 tons to 2,000 tons, deliveries extending through March, at $10.50 @ $10.60. In finished material there is about the same volume of business; perhaps a greater number of small-lot buyers are in the field, but it is very difficult to keep mills going.

Detroit. Wm. F. Jarvis & Co. write us of the pig iron outlook, emphasizing the short supply, both in makers' and consumers' hands, of Lake Superior charcoal pig iron: "There are to day but five furnaces in Michigan and Wisconsin that are making iron, and but four up to the time that our Vulcan plant started about two weeks ago. The total production we think will not exceed 8,000 tons per month, and it is our opinion that business is just on the turn, that when matters are definitely settled at Washington, no matter how they are settled, we will fit ourselves to the conditions as they may then exist, and proceed rapidly to a resumption of large business. There is quite a little inquiry for Lake Superior charcoal iron for malleable purposes from widely separated points. Part of this is for immediate consumption on orders, and part we know to be the result of careful thought on the part of buyers which induces them to think, as we do, that no mistake can be made by contracting for a good sized amount of iron at present figures, and shows their faith in the future, when they are willing to contract for their normal supply of pig iron. The coke iron market from different sections, differs in proportion to the stocks on hand and feeling of the future. It is not uncommon that $1 per ton difference is made on practically the same iron for the same delivery. The coke iron market is certainly in a very curious shape at present."

Louisville. The chances seem to be that the tariff debate in the Senate will run into the summer. While from depletion of stocks there may be a slightly increased demand for material, there will be no healthy activity, and the present unremunerative prices to both manufacturer and labor must continue. Sales are at the lowest prices.

Cincinnati. In the past week some good sized contracts have been placed for radiator work, stove foundries and pipe works. Further than this, car-load and 100-ton orders have made up the trade. Car wheel iron is moving again; but where, a year ago, contracts for round lots were freely made, now only car loads are wanted. Malleable foundries, especially those depending upon railroad orders, are very quiet.

THE IRON TRADE REVIEW

DEVOTED TO

IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.

PUBLISHED EVERY THURSDAY BY

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FEBRUARY 1, 1894.

THE RESPONSIBILITY FOR CUTTING.

While Mr. Carnegie's remarkable burst of confidence, in the interview had with him at New York three weeks ago, has dropped out of current discussion, the policy of his company, to which he made reference at that time, is still a subject of comment. Events keep pressing it upon the attention of the trade in a way that makes it an ever-live topic. The Carnegie Steel Co. is big, and the natural disposition is to exaggerate its influence upon the market. Long before Mr. Carnegie admitted that the any-price-to-get-the-order campaign was on, it was credited with most of the cuts in products of its mills, and oftentimes unjustly. But we believe the facts do not bear out the claim made in the recent Pittsburg defense of Carnegie, that in the present cutting carnival he "has not led in the decline, but as a rule has followed, and in many cases some distance behind." There is no doubt that prices have been made below the bids of the Carnegie Steel Co.; otherwise there would not be so many other mills in operation, even partially and spasmodically. But there are too many instances of recent record in which the Carnegie Steel Co. has taken orders by making an unprecedented price, to bear out the assertion that others are the aggressors. For example, take a contract on which sealed bids have been asked from a number of manufacturers. An offer to take the work at a stated price below the lowest bid thus submitted would hardly be cited as proof of a disposition to hold up the market to the standard of legitimate trading. This the Carnegie Steel Co. has done, not once nor twice. And it is not to the point to tell what the policy of this company has been in other times. The question of live interest is as to the responsibility for aggravating the bad conditions that have existed in the past few months.

Whether there are other manufacturers who can produce as cheaply as the Carnegie Steel Co. is not particularly pertinent to the discussion of departures from recognized methods of getting business. There is no warfare of extermination on, and the idea thrown out in a good deal of the loose talk about supremacy in the steel market, that there is an effort by the largest producer to get control of the business, is as idle as the statement, seriously elaborated by a Chicago newspaper last week, that prominent iron and steel manufacturers are arranging to combine against the Carnegie Steel Co. If it should be shown that the Carnegie Steel Co. had gone below the figures on its cost sheet, in recent transactions, no new discovery would have been made, since Mr. Carnegie himself announced that orders were being taken "regardless of price."

The damage done by the policy that has prevailed of late, is in the exaggerated ideas it conveys of the possibilities of cheapness in home production of iron and steel. Two years of such claims on behalf of the mines of the Mesabi range have furnished the Wilson majority of the Ways and Means Committee with the very answer they wanted to any protest against free iron ores. And while thousands of citizens of Duluth sent protests against the removal of the duty on ore, the Congressman from the Duluth district had read so often in his home newspapers, and heard so often from the lips of home boomers of the Mesabi, the extravagant and untrue stories of its cheap production, that he was able on the floor of the House to meet testimony with testimony. There is no question of the desire on the part of many Congressmen of the majority to make an iron and steel schedule that will hurt the Carnegie Steel Co. That company has played a far more important part in the debate on iron and steel duties than the very pertinent question of the difference between home and foreign wages of iron and steel workers. The disposition appears to be to make the metal schedule duties so low that the largest and, in popular thinking, the cheapest producer, shall suffer a distinct curtailment in profits.

Taking orders regardless of price is not business-like, nor is it philanthropic; it has furnished free traders with the weapon they wanted to beat down duties; it has laid the foundation for an endless series of departures from business ethics; it has even given occasion for the charge that it had back of it an indifference as to iron and steel duties, born of a confidence that one producer, at least, would continue to operate, whatever the tariff.

Charges and counter-charges and avowals and disavowals will not count half so much in correcting the evil, as a withdrawal of the any-price-to-get-the order instructions, and a general effort by the trade to preserve the integrity of sealed bids.

WORK OF THE FOUNDRYMEN'S ASSOCIATIONS.

No more interesting paper and discussion, we venture to say, have occupied the attention of any trade or technical association in a long time, than those contained in the proceedings of the Western Foundrymen's Association's January meeting, given elsewhere in this issue. Not a few comments have come to us from readers of this paper as to the practical value of the paper of Mr. E. A. Wheeler, of Sharon, Pa., read at the December meeting, comparing furnace and foundry practice. The discussion on this paper was also full of suggestion and help, albeit the attendance was not large. More foundrymen came together at the meeting in Chicago last week, and a reading of the paper of Mr. C. K. Pittman, on "Coke in the Foundry," and the very interesting discussion upon it, will explain the remark of a prominent Northwestern foundryman that he would not again miss a meeting of the Association if it were at all possible for him to attend.

The Western Foundrymen's Association has had a somewhat different experience from that of the Foundrymen's Association, whose meetings are held in Philadelphia, in that outside foundrymen have shown a greater appreciation of its value than those living in Chicago. Philadelphia foundrymen, on the contrary, have always furnished the bulk of attendance at the Eastern Association's meetings.

Another difference is in the character of the papers and discussions—those at Chicago being exclusively on practical problems of foundry operation, while the Philadelphia Association has paid quite as much attention to the commercial side of the business. Both have brought out exceedingly valuable contributions to foundry literature, that but for these organizations would never have seen print; and attendants at the meetings have had their experience brightened by contact with other practical men. There has been no giving away of business secrets, yet there has been an interchange of valuable commodities —the views of men who have succeeded, but who recognize that they have not discovered the best way of doing everything.

It is not the pressure of business that has prevented a more general participation of Chicago foundrymen in the meetings of the Western Association, but rather, perhaps, a misapprehension of the basis on which the organization started. A free forum for the discussion of questions of interest to every practical foundryman is the evident design of the constitution, rather than the establishment of an association for regulation of wages or prices. There are indications of a more general appreciation in Chicago of what outside foundrymen discovered early, that the Association has large possibilities of benefit to its membership, and the action taken last week appointing meetings in the day-time instead of the evening will undoubtedly help to the large attendance the papers and discussions have always merited.

THE STRONGEST PLATES FOR VESSEL HULLS.

In commenting on the questions raised in connection with the loss of the steamers Gilcher and Western Reserve, in the fall of 1892, *The Iron Trade Review* called attention to the effort, in the construction of steel vessels, to build lightly and cheaply, and at the same time to secure large capacity. It was pointed out that to stipulate that a proposed vessel should have a certain capacity, and at the same time not exceed a specified cost of construction, was to emphasize cheapness rather than strength; that while builders may plan to give the greatest strength possible, with the use of cheaper and thinner plates, they could build more strongly and safely with heavier plates, though, of course, at a somewhat increased cost. While there was some shaking of heads among vesselmen, in the discussions about the Gilcher and the Western Reserve, and an intimation here and there that the old wooden vessel might find favor again, no backward movement has taken place. There has, however, been an increasing disposition to make strength a foremost consideration in the limited amount of shipbuilding that has gone on in the past year. That ground is yet to be gained in this regard is indicated by the following extract from an editorial in our valued contemporary, the *Marine Review:*

The change from wood to iron, and later to steel vessels, has been a matter of only a few years, and while owners were enabled by their experience to judge of the material and workmanship entering into their wooden vessels in the past they have little experience to guide them as to what should be used in the construction of steel vessels. It would seem as though it should be necessary to use the very best and strongest material for the hull plates of a vessel, for the same reason that renders it wise to use nothing but the best for boilers, and if open hearth steel is necessary for the latter it seems just as necessary that equally as good material should be used for the hull plates. Why it is, then that inferior material, such as Bessemer and basic steel, should be permitted to be used for this purpose, is a matter that will at least bear careful investigation by the owners as well as the builders. Although there is now more care used in the selection of material than in the past, it is no secret that within the past two years steel plates furnished for the construction of vessels to some of the builders on the lakes, and made from material which has been used for the construction of hulls, have shown most remarkable signs of inferior quality. In one shipyard a plate broke in two on being thrown from a truck, and in another instance two plates, after having been placed in position on the hull, broke in two with comparatively no strain upon them. These plates were made, it is understood, of basic steel, a quality that is claimed by its manufacturers to be superior to the Bessemer.

It is evident that there is room for improvement in steel of this grade, and if acid open hearth steel is the only suitable quality for marine boilers that will pass government inspection, it would seem apparent that builders should use equally as good material for their hulls, and especially in view of the fact that the present cost of such material is within $1 or $2 a ton, at the most, of the price of the inferior material. We learn that of late several of the lake builders have, for their own reputation as well as at the request of the owners, used open hearth steel for their hulls, for which they paid from $3 to $5 a ton more then the basic or Bessemer steel could be procured for, and we are informed that the difference in price now is not more than $1 a ton in extreme cases, so that there is very little excuse for using inferior material for any purpose at present.

THE accumulation of money in the banks of New York was advanced $7,635,600 last week, the total at the week's end being $246,000,000 or $110,000,000 in excess of legal requirements. Loans decreased nearly a million dollars. Such a record settles the claims of positive improvement in business up to this time, but we shall look for some slight change for the better, as the opinion grows that tariff legislation, if any shall be brought forth the present year, will be less hurtful than the Wilson bill draft had lead the people to believe.

Is it the fear that the measure embodying their pet theories will not become a law that deters men who believe in the Wilson theory from making investments and helping to put business on its feet? If the passage of the Wilson bill is to usher in a period of prosperity and expansion, there can be no other excuse for hesitation on the part of capitalists who pin their faith to it.

THE statistics of production in 1893 emphasize anew the passing of the supremacy in manufactured iron from Pittsburg to the valleys, and the further stride the Pittsburg district has taken in the production of steel.

Must Close if the Wilson Bill Becomes Law.

Correcting a publication in the daily press concerning the resumption of operations at their works, the Union Steel Screw Co. write us under date of Jan. 29: "We expect to start a small portion of our machinery only on the 1st proximo, so as to work up some special orders which have accumulated during the five or six weeks our factory has been shut down, but we should not be warranted in running our entire factory under present business conditions. Usually at this season of the year we run on full time, but our ability to do this again in the future depends upon the action of Congress with regard to the Wilson tariff bill. If the provisions of that bill which relate to our industry become a law, we have two courses o action before us—either to find another country in which to operate our plant, or to close it entirely so far as its present products are concerned."

FIRE partly destroyed the building at 63 and 65 Canal st., Chicago, and the occupants suffered loss as follows, Adkins & Pickins Co., engineers' supplies, $4,000; Stillwell-Bierce & Smith-Vaile Co., pumps, etc., $4,000; Thomas F. Ester Pump Co., $2,000.

NEWS OF THE IRON MINES.

The Cleveland Cliffs Iron Co. and the Cleveland Iron Mining Co. held their annual meetings in Cleveland, Jan. 24. The directors and officers elected are the same for both companies, and are as follows: Directors—T. P. Handy, E. R. Perkins, Wm. G. Mather, J. H. Wade, Amos Townsend, Samuel Mather, J. H. McBride, J. H. Hoyt, Peter White. Officers—Wm. G. Mather, president and treasurer; J. H. Wade, vice president; J. H. Sheadle, secretary.

The real estate of the Buffalo Mining Co. at Negaunee, Mich., sold at sheriff's sale, Jan. 29, being bid in at $320,000 by Price McKinney, receiver of Corrigan, Ives & Co., of Cleveland. On Saturday, Jan. 27, the machinery and personal property, including about 145,000 tons of ore, were bid in by the same buyer at $80,000. Corrigan, Ives & Co. held large claims against the Buffalo Mining Co. on advances made last year. The resumption of operations will depend upon the settlement of pending questions relating to royalties, and upon the development of a demand for ore. The report that Rockefeller capital will have a hand in future operations is purely conjectural.

At the Brotherton mine, at Ironwood, the pumps have been taken out, and the mine will be allowed to fill with water. The prospects are that it will go unworked for some time.

At the Swanzey mine, 20 men have been taken on. About 100 feet of sinking remains to be done before the second shaft is completed.

The Volunteer, on the Marquette range, and the Florence and Commonwealth, on the Menominee, are the only non-Bessemer mines now producing in the Lake Superior region.

The arrangement between the Standard Ore Co. and the Thomas Iron Co. provides for the payment by the latter of 80 cents a ton at the mine for all Hale ore mined. The Thomas Iron Co. engages to take 50,000 tons a year for six years and has the privilege of mining a larger amount at the same rate. The ore will be carried to Buffalo and thence over the Lehigh Valley road.

Further Cuts in the Metal Schedule.

Changes for the worse in the metal schedule were made in the final hours of the general House debate under the five-minute rule, on the Wilson bill. The effort made on Friday, Jan. 26, to wipe out the duty on tin plate had failed. On Saturday Congressman Johnson tried to get the steel rail duty cut down to 5 per cent.; then two amendments were proposed in turn making the duty 10 and 15 per cent. The 20 per cent. duty recommended by the committee was finally adopted, making a cut of five per cent. from the original recommendation. Then came further reductions as follows: Pig iron from 22½ to 20; scrap iron and steel from 22½ to 10; structural iron, wire strips of steel, etc., from 35 to 30; boiler plate and other iron and steel plates, forgings of iron and steel, hoop, band and scroll iron and steel and wire rods, 30 to 25; iron in slabs, blooms, etc., 25 to 22½.

Some protests against these cuts came from Southern Democrats, notably Mr. Washington, of Tennessee. Mr. Beltzhoover (Dem.), of the Cumberland, Pa., district had the clerk read a strong letter from a Democratic constituent, who has a blast furnace in Virginia, protesting against the passage of the bill.

Mr. Dalzell, of Pennsylvania, called attention to the fact that within two hours of the close of the consideration of the customs schedules of the tariff bill the committee brought in this proposition to radically cut the already ruinously low duties of the metal schedule. The duty in the Wilson bill of 22½ per cent. on pig iron would close every furnace east of the Alleghenies and in the State of Alabama. Yet at this late hour it was proposed to lower it to 20 per cent. Mr. Washington's amendment to make the duty $3 per ton was lost without division. The committee amendment substituting 20 per cent. for 22½ per cent. was adopted, 123 to 99.

Received from the Trade.

The Robt. Aitchison Perforated Metal Co., 269 Dearborn st., Chicago, have sent out a little map of the business portion of the city of Chicago, showing in colors the location of the banks, depots, freight and passenger, hotels, libraries, public halls and buildings, steamship lines, theaters, ticket offices, etc., together with the street number of every store and building in that part of the city. In the corner is a calendar for 1894. This is one of the best advertisements of its kind that we have received, and it reflects credit upon the enterprise of the Aitchison Co.

The Northern Refrigerator Co., of Grand Rapids, Mich., send us illustrated catalogue of their seven-walled Glacier refrigerators, which received a medal at the World's Fair. A novel idea is the insertion as a sort of frontispiece, of a sheet of wool felt used in these refrigerators and with it a sample of the charcoal sheathing, used as lining. It is water-proof, non-odorous and a non-conductor of heat. The seven walls, which ensure the cold, dry air that is a foremost claim for the Glacier, are the outside case, wool felt, air space, charcoal sheathing, inside case, water-proof paper and zinc lining. All the parts of the Glacier are shown in cuts and their special features graphically emphasized. The Northern Refrigerator Co.'s works have a capacity of 200 complete refrigerators a day and in their five large warehouses is a stock of 20,000 refrigerators at the beginning of a season.

"The Stranger" is the title of an illustrated ballad that is floating through the mails in an innocent and alluring sort of way, recounting in eight stanzas the missionary endeavors of a philanthropic traveler. His hobby is the enlightenment of roofers on the merits of a roofing that positively sheds water, and the tale leads up to this denouement—that the Kanneberg Roofing Co., of Canton, are manufacturers of patent steel roofing, corrugated iron, and a variety of other high grade products for building purposes.

Southern Boom Sequels—A Reorganization.

The boom city of Ft. Payne, Ala., was sold under the hammer last week, to E. N. Cullom, for $60,000. The sale includes 30,000 acres of ore land, 2,000 city lots, ore-crushing works, furnaces, three factories, two hotels and other property. Ft. Payne was the first experiment of a number of New England capitalists to found a city in the South. The purchase money will be divided among the holders of the preferred stock and the old Colony Trust Co., of Boston, which holds a $300,000 mortgage. Several million dollars have been sunk.

At Sheffield, Ala., Jan. 24, the properties of the Sheffield Land, Coal & Iron Co., which embrace large tracts of coal and iron lands along the Sheffield & Birmingham Railway, together with valuable property in Sheffield, were sold at auction, and bid in by J. H. Noble, of Anniston, for $35,000. It is said to be valued at $1,000,000.

C. P. Williamson, president of the Williamson Iron Co., Birmingham, Ala., has been appointed receiver for the company. Its capital is $150,000, and it owned a furnace at Birmingham with 15,000 tons capacity. A receiver has also been appointed for the Birmingham Iron Works, capital $150,000, which has defaulted on its bonds.

The Southern Iron Co., of Nashville, Tenn., has decided upon a reorganization. It owns seven charcoal furnaces, and other property, all of which will be sold at Huntsville, Ala., Feb. 20, by the Central Trust Co., under deed of trust dated Jan. 1, 1890. A committee of holders of the company's securities will buy it up. The new name will be the Central Iron Co. This company will issue $2,000,000 bonds, $2,400,000 preferred stock and $900,000 of common stock—total, $5,300,000—as against $7,000,000 issued by the old company. The holder of $1,000 Southern Iron Co. bonds gets $350 in bonds and $650 in preferred stock of the Central Iron Co. Southern Iron Co.'s stock is taken up by giving $333 new stock per $1,000 for old stock.

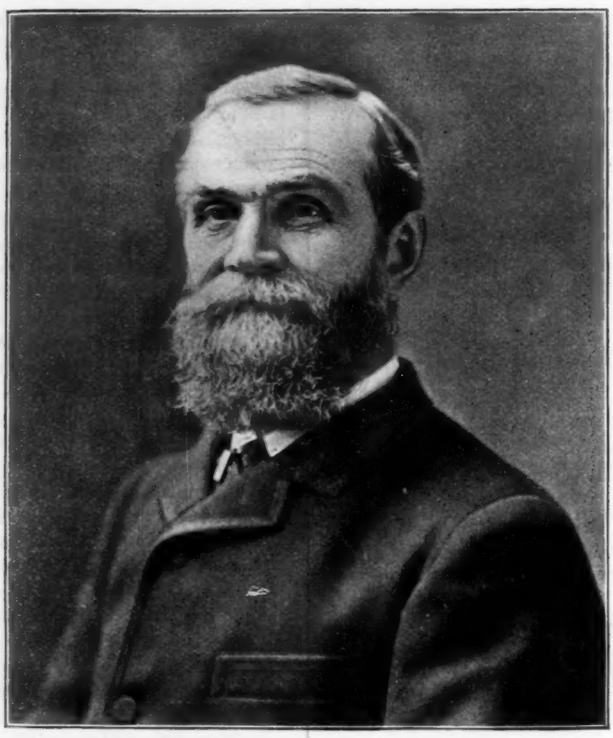
THE four-story brick building at 51 and 53 S. Canal st., Chicago, was partly destroyed by fire, Sunday morning. It was occupied by B. F. Gump, dealer in flour mill machinery and tools; the Erwin-Welch Hydraulic Machinery Co., manufacturers of pumps, etc.; the Crandall Packing Co., of Palmyra, N. Y., and the Vitrified Wheel Co., of Westfield, Mass., manufacturers of emery wheels. The losses were as follows: B. F. Gump, $28,000; insurance, $40,000; Erwin-Welch Hydraulic Machinery Co., $4,000; insurance, $2,500; Crandall Packing Co., $600; insurance, $800; Vitrified Wheel Co., $2,500; insurance, $2,500. The structure is of historical interest, as after the great fire of 1871 the Board of Trade was located there for several years.

THE LATE GEORGE H. ELY.

The sudden death of Hon. Geo. H. Ely, at Washington, of which only mention could be made in our last issue, removes one who was easily the foremost authority on the important interests involved in the commerce of the Great Lakes, and first among advocates of liberal public policy in their development. No man identified with iron mining had made more exhaustive research to fix its industrial status and to none is the Lake Superior iron ore interest more indebted for the body of accurate statistical information that exists, establishing its place as a prime factor in our mineral resources. The vessel interest, also, found him an invaluable ally in the effort to acquaint the public, and particularly legislators, with the importance of our inland water ways and the need of doing all that could justly be done to build up these great highways of internal traffic.

When death came upon him, Mr. Ely was in Washington, bearing the protests of lake carriers and of capital and labor engaged in iron mining, against the Wilson bill proviso, putting iron ore upon the free list. In the original hearing before the Ways and Means committee he presented an admirable epitome of the argument against free iron ore, packing it with freshly gathered statistics, showing the amount of capital invested in Lake Superior mines, the number of laborers supported by them, and the vast aggregate of railroad and vessel property for the existence of which this single industry was responsible. He had been one of the pioneers in Lake Superior iron mining and had witnessed the marvelous expan sion of the carrying trade of the lakes, watching it with something akin to a paternal interest. To write of it or speak of it, and especially to gather and put in permanent form statistics, telling of its vast extent and its wonderful development, was to him a delight. He had a peculiar taste for statistical work which enabled him to invest what were to many minds only dry figures, with a significance and an attractiveness that begat interest and carried conviction.

His labors at Washington in behalf of lake improvements began with his appearance before a Congressional committee in 1880 against the effort to get the Government's consent to a bridge over Detroit river. In 1890 he again made a successful argument in the same behalf. The culmination of efforts in which he participated will soon be witnessed in the completion of the new St. Mary's Falls canal lock, the Hay Lake channel and 20-foot channel, aggregating a cost of millions. At the Fifth International Congress on Inland Navigation, in Paris, in the summer of 1892, the most conspicuous paper was that of Mr. Ely on "The Great Lakes of North America." He was sent to represent the American Society of Civil Engineers, and the pith of his argument was that the iron and steel interests of the United States would never have reached their present eminence but for the cheapening of these products through the exceedingly low cost of ore transportation afforded by the Great Lakes. Early investments in Lake Superior properties made it possible for Mr. Ely in later years to devote the time necessary to collect and to put in permanent form the valuable information which he has contributed to the public. All this labor has been self-imposed, and all his service has been freely given. His intimate acquaintance with the great interests centered in Cleveland made him the natural representative of that city in National commercial gatherings, and one of his errands in Washington at the time of his death was to participate in the proceedings of the National Board of Trade.



George H. Ely

George Hervey Ely was born in Rochester, N. Y., Oct. 18, 1825, his father, Elisha Ely, being one of the founders of that city. He entered Williams College in 1846, and graduated two years later, returning in 1851 to receive the degree of master of arts. He soon afterward removed to Cedar Rapids, Ia., to take charge of the estate of his deceased brother, Alexander L. Ely, which comprised a large flouring mill and landed interests. He returned to Rochester, two years later, to engage in flour manufacturing, and remained there seven years. The possibilities of the Lake Superior iron mines attracted his attention, and he decided that a large field for enterprise lay in that direction. It was seen that railroad facilities were needed first of all, and with his brothers, Samuel P. Ely and Heman B. Ely, he built a railroad leading from the mines to the lakes. This was completed in 1857, and after operating a short time as the Iron Mountain Railroad, was absorbed by other lines, being part of the present Duluth, South Shore & Atlantic.

Mr. Ely moved to Cleveland in 1863, and became a partner of H. B. Tuttle, who had been the Cleveland representative of the company which the Ely brothers formed. This partnership continued until Mr. Tuttle's death, in 1878. Then Mr. Ely entered into partnership with his brother, under the name

of George H. & S. P. Ely, the iron business being greatly developed by them. Their interests were largely in Vermilion range mines, though they had investments also on other ranges. For several years the Minnesota ores were handled by Geo. H. & S. P. Ely, until the interests of both in the Vermilion were sold to the Minnesota Iron Co. Investments were made by both, a few years ago, in the Cuban iron mining properties which the Spanish-American Iron Co. was organized to develop, Mr. S. P. Ely being the secretary of the company. Mr. Ely's Cuban interests would have been furthered by free iron ore, yet he believed that the capital and labor employed in Lake Superior iron mining deserved protection, and he consistently and vigorously advocated that policy.

Mr. Ely was elected to the Ohio Senate in 1883, and was reelected in 1885, being at the head of his party in that body. For several years he has been president of the Western Iron Ore Association, and a short time ago was elected a vice president of the American Protective Tariff League. He appeared before the National Tariff Commission in 1882, and his testimony had much weight in determining the iron schedule. He was president of the Central National Bank of Cleveland, a director of the Chamber of Commerce, and a trustee of various educational and charitable institutions. His thought and effort were centered in the public welfare.

The Cleveland Chamber of Commerce, the Central National Bank and the Western Iron Ore Association have adopted memorial resolutions, paying tribute to Mr. Ely as a man and as a tireless worker for the public good. Col. James Pickands presided at the meeting of the Western Iron Ore Association, and the committee to draft the memorial was made to consist of Wm. G. Mather, E. W. Oglebay and D. B. Chambers. The following expression has been prepared by the committee:

"This association feels in a special sense the death of its esteemed president, Hon. George H. Ely, since its formation was largely due to his efforts, and its continuous and active work on the lines in which it was formed was the result of his untiring and able leadership. Mr. Ely's able papers and addresses on the question of a protective tariff, especially in connection with the Lake Superior iron ore industry and the commerce of the Great Lakes, are well known throughout this country and abroad, and always commanded most careful attention and respect, and reflected great credit not only upon himself, but also on this association. His well trained mind, great industry, and conscientious conviction that the policy he was advocating for us was right, and, above all, his high character, made him invaluable to this association. We tender to his sorrowing family our deepest sympathy, and desire to testify to our sense of especial grief, since it was in our service, representing and contending for our objects, that sudden death claimed him, and sent back such a shock and sense of loss to us and to the whole community.

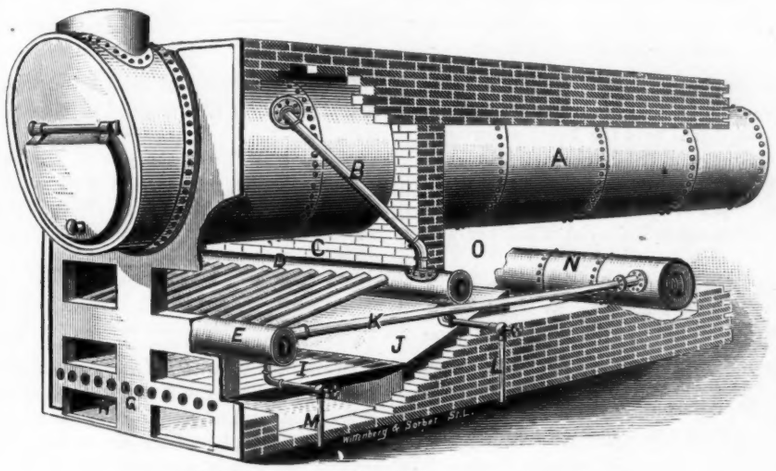
ONE of a battery of boilers at the Duncannon Iron Co.'s rolling mill at Duncannon, Pa., exploded, Jan. 29. No lives were lost, and the interruption to the mill was only temporary.

VALLEY steel plant, Belleville, Ill., starts with 350 men.

STANDARD DOWN-DRAFT BOILER FURNACE.

The illustration gives a view of the Standard down-draft smokeless boiler furnace, the invention of Chas. E. Southard, on which a patent was issued Jan. 2 of this year. The patented portions of the device may be applied to any boiler now in use, and the inventor claims that it will prevent smoke, besides working a considerable saving in coal. In the cut, A is the boiler, B and K are circulating pipes, C a solid screen, D, the upper grate bars, I the lower grate bars, J the bridge wall, E the front manifold for the grate bars, N the mud-drum, O the combustion chamber, M a blow-off pipe.

The upper grate-bars are made of extra heavy tubing. The outer manifold E has within it a perforated brass steam pipe. Near one end of the rear manifold opposite manifold E there is a steam pipe B, which is connected to the side of the boiler in the steam space. Near the end of manifold E there is a hot water pipe K which is connected with the mud-drum beneath the boiler. The attachment of the mud-drum to the boiler is not shown in the cut. On the pipe K there is a valve, not shown, for controlling the admission of water from boiler. Below the set of fire-bars D, there is a set of hollow grate-bars I, which have their front ends passing through the fire front, above G and are open to the air. At the end of these bars there are also openings to permit the air from the front to pass upward over the bridge wall J, to mingle with the burning gases from the upper bars D, under the manifold E and the one opposite it.



STANDARD DOWN-DRAFT BOILER FURNACE.

A device similar to this, which was patented in 1888 has been in use since that time by the Wrought Iron Range Co., manufacturers of ranges and furnaces at St. Louis. The attachment patented Jan. 2 is in operation on the two boilers at the same place, and gives satisfaction. There is also one in use on the new Culver Building of St. Louis. Mr. Southard's address is 3103 Thomas st., St. Louis.

Connellsville Coke Output in 1893.

Reviewing the coke trade in the Connellsville region in 1893, the Connellsville *Courier* says that it was worse in price than in production. The total output for the year was 5,054,797 tons which is exceeded by but three previous years—1889, 1890 and 1892. The average price, figuring in foundry and crushed coke and taking account of contracts which were at prices varying from those of the market month by month, is found to be $1.50, making a total for the year's sales, of $7,582,175. Within the year the price dropped from $1.75 and $2 a ton in January, when the car supply was short, to $1 in December, and the ruling price now is 90 cents, with sales reported as low as 85 cents. Among the events of the year in the Connellsville region, the *Courier* notes the completion of the Frick map of that region, the result of several years' labor by a corps of engineers. It settled a great deal of speculation as to the the amount of workable coal left in the Connellsville region. It demonstrated that the workable coal remaining aggregated 75,000 acres, and the region was good for 60 years more of coke production. It is estimated that there are $55,000,000 invested in the coke region.

THE ANDREW PATENT CHUCK.

There is no tool more generally used in machine shops than the drill press, or a wood boring machine in the wood working department of car works, in planing mills, carriage and furniture factories. The spindle and the chuck for holding and driving the bit are the most essential thing about either of the above named machines. The inventor of the M. L. Andrew patent twist drill and auger bit chuck, illustrated herewith, calls attention to it as especially noteworthy for simplicity and substantial construction. The points he emphasizes are these: That it can be made direct on the spindle of a machine, without changing the old system of straight and taper shank tools; that it is not necessary in order to hold and drive the drill or cutter bar to cut deep Vs in the shank; that it holds any taper shank tool with the flat end broken or twisted off, as well as any new tool; that it will hold the heaviest straight or taper shank boring bar used in the largest upright drill press, and will not let the bar drop out of the socket when doing the heaviest kind of upper or under cutting; that it has no outside projections to throw the spindle out of balance, and will not mark or bruise the shank.

Of the illustrations, Fig. 1 represents a sectional view of the spindle to a drill press or boring machine. By screwing up the cap nut C, the hardened steel flaring ring B is forced upon the hardened steel key A, which in turn is forced into the half round groove in the drill shank D, with sufficient force to hold the largest and heaviest drill or boring bar used, simply requiring the grip of the hand, although a spanner may be used on extra heavy bars. Fig. 2 represents a sectional view of a drill shank inserted in the chuck, and the steel key A, fitting into the groove of the shank, for holding and driving the tool. The steel spring lifts the key out of the groove when the shank is released. The cutting of the small half round groove on one side of the shank, as shown in Fig. 2, is all the change necessary on the shank of tools to permit the making of this chuck direct on the spindle of drilling or boring machines. By cutting this groove, all taper shank tools may be saved with the flat ends broken off. Fig. 3 represents the Andrew patent collet with hardened steel tongue E. It is made to the Morse standard taper inside and outside, or tapering outside and parallel inside, to accommodate straight shank drills in a taper chuck. It is also used to advantage in the turret lathe, to prevent the set screws from destroying the shanks of valuable tools.

The G. A. Gray Co., of Cincinnati, who use the Andrew chuck, refer to the fact that after a long period of hard work the shanks on their bars and drills are as true and unmarked as when they first came from the tool room, and that the old taper shanks that had been thrown aside on account of the flats being twisted off have been brought into service again. Chas. A. Bauer, general manager of Warder, Bushnell & Glessner, Springfield, O., refers particularly, in writing of the Andrew chuck, to its advantage in holding a taper shank tool for "under cut" work, like facing or counter boring from the underside of a casting, it being almost impossible to do this class of work with the ordinary taper shank tools.

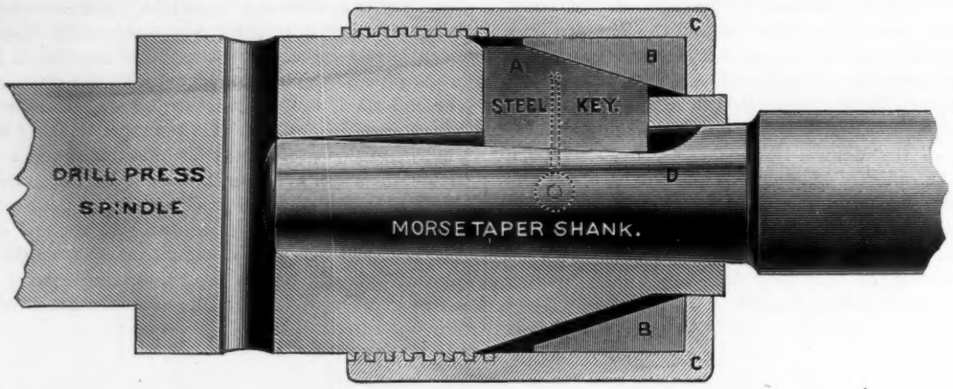


FIG. 1.

The manufacturers of the Andrew chuck are M. L. Andrew & Co., 59 and 61 Elm street, Cincinnati, O.

A Great Output of Charcoal Iron.

W. H. Hinkle, secretary of the Ashland Iron & Steel Co., writes us that the company's Hinkle furnace at Ashland, Wis., was blown out, Jan. 25. It was put in blast Dec. 27, 1890.

Total number of days in blast	1,125
" " " stopped	91
Actual running	1,034
Total gross tons made	112,118
Average per day	108.4

During the first half of the run, the charcoal supply was not sufficient to keep the furnace running at an economical point, and it was banked at intervals to allow fuel to accumulate. The charcoal plant later on was increased by the addition of several new sets of kilns, so that the furnace has been making latterly 120 tons of iron daily. The company has a full assortment of iron on hand, and will take advantage of the present depression to make needed repairs, and be ready to resume operations whenever the business situation warrants. The amount given above is the largest ever made from charcoal on on one hearth in the same time, and the run is one of the longest on record.

FIG. 2.

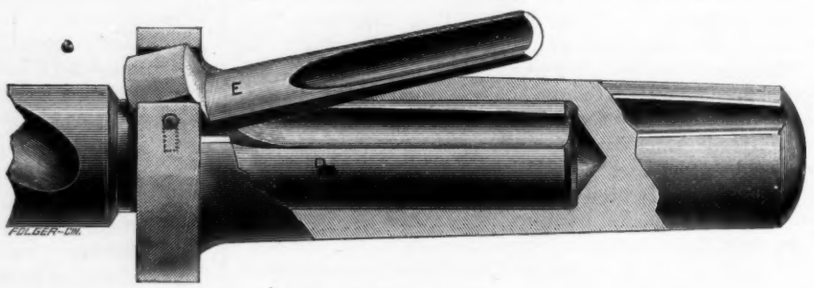


FIG. 3.

MR. R. D. KUHN, for the past two years manager of the Chicago office of Park, Brother & Co., limited, has been transferred to the Cleveland office, of which he was manager before coming to Chicago. The Chicago office will in the future be under the management of Mr. Edwin S. Jackman, who will at the same time continue the management of the Edwin S. Jackman Co., dealers in steel and copper and railway specialties. The offices of both companies will be as heretofore, at 901 The Rookery, Chicago.

COKE IN THE FOUNDRY.*

BY C. K. PITTMAN.

In the year 1849, Overman, in his book, "The Manufacture of Iron," said: "As there is but little prospect of an addition to the number of coke furnaces which now exist, we shall devote but a limited space to this subject." The value of coke produced at that time was about $15,000. In 1891, the output was about 10,350,000 tons, with a valuation of over $20,000,000. This marvelous development is due to the superiority over other fuels for iron working. There are other fuels that are better than coke for some specific purposes, but no other unites to so great an extent the qualities needed in the reduction of ores and the melting of iron, and, I may add, for domestic purposes.

The coal deposits from which is made the coke we use here, are found in the States of Pennsylvania, West Virginia, Virginia, Kentucky and Alabama. The latter produces about 13 per cent. of the total output, but its use is confined wholly to the South. In the far West, the Colorado field, as far as now known, is the most important. Her smelting and iron works are supplied wholly from her own ovens, and, while this coke is not equal to that of the East, there are still undeveloped deposits of coking coals that will before long furnish a fuel of the best grade. The coke that comes to this market is produced in the three States first mentioned, and in a general way may be classified as the Connellsville, from Pennsylvania; coke from the Fairmount region, in Northern West Virginia; New River and Kanawaha cokes, from the central and western parts of the same State, and the Pocahontas coke, from the southern parts of Virginia and West Virginia. There are many other cokes, not included in this general classification. The area of the coal deposits from which these cokes are made is so extended that there is a wide diversity in quality and characteristics. They range from the bad to the excellent, and it requires considerable knowledge and experience to pass upon their merits.

It is surprising to find how limited is the knowledge of coke, not only among people in general, but even among those who, from the nature of their business, should be informed. It is more curious that so few of those who manufacture coke have an intelligent understanding of the product of their ovens.

The history of the production of iron and steel shows a wonderful development, preceded and attended by careful and scientific investigations. In the manufacture of coke, we are using essentially the same methods that were used at the beginning of the industry. Little effort has been made to lessen the enormous waste of fuel, or to discover the means of making the product more uniform and effective. Within a very few years there has been a movement in this direction, and though comparatively little has been accomplished, there has been a decided gain. Generally speaking, European practice is in advance of ours.

To what extent the quality of coke can be improved is a question. My own belief is that it can be greatly benefited by better methods. So long as we have unlimited coking coal, the need of better methods of manufacture will not force itself upon us. The production of some of the very best coke regions has already begun to diminish. The needs of the iron trade forced the use of low grade ores that had been esteemed wholly useless. The same condition of affairs will affect the coke industry. Coals that now produce inferior coke will revolutionize their process, and competition will oblige the purer coal to follow, in a measure, the same course. We have already come to recognize one fact, and that is that the same methods will not apply to all coals. Variety of coals requires variety of coking, if uniform results are to come. In one of the coke regions referred to above, a number of the operators made so poor a coke that their sales dwindled to the starvation point. Instead of giving up the battle, they called to their aid the help of the chemist and the engineer. They changed their methods radically, and to-day an increased output and larger sales, with much more satisfactory returns, are the result.

The mechanical process of making coke, as now in use, is too well known to need more than passing mention. This fuel is obtained by the expulsion of the volatile constituents of coking coal and a portion of the impurities, through the action of heat, leaving behind all of the fixed carbon and sometimes more, together with the earthly constituents, as an ash. It is rather distillation than combustion. The quality of the coke depends primarily upon the character of the coal, and upon the skill and judgment of the coker. Under the present methods, a good coal can turn out a poor coke, but a poor coal can hardly produce a good coke.

The burning continues for 48 hours for furnace and 72 hours for foundry coke. For foundry use, it is generally thought necessary to have the 72-hour coke. I do not think this belief is well founded. Furnace coke will, for general use, give as good results in the cupola as the foundry coke. For special purposes, the harder coke may be needed.

The objection to the black ends is largely a prejudice. To test this, the manager of a large iron foundry had three cars of black ends coke sent to the works. The foreman promptly reported the arrival of the bad coke. To his astonishment, he was instructed to accept and use it. Puzzled and unwilling, he did so. The black ends were used, and the results were the same with gray coke.

All coals contain more or less sulphur, and many phosphorus. To reduce these two substances to the minimum is a constant labor. The sulphur occurs to a greater extent than phosphorus, and its elimination is one of the problems of coke making. We may say that the amount of phosphorus is so small in the better class of cokes that they need not be considered. That sulphur is a deadly enemy of iron nearly all foundrymen are agreed, yet some good authorities claim that in a general way a certain proportion of sulphur improves the iron, making it stronger and more fluid without weakening it. How far this is true is very uncertain.

The ideal coke for foundry use is one that has the greatest amount of fixed carbon, a cellular structure that is strong enough to carry the burden and produce the most perfect combustion, has no ash in excess of what is needed to insure the most efficient work, and is free from those substances that will change the character of the metal and weaken it.

Our knowledge of the chemical changes that coal undergoes when converted into coke is meagre, and until they are known we cannot produce that best fuel that we are seeking. Yet many of our cokes approximate to it.

The necessity for scientific methods, based upon accurate knowledge, is becoming more apparent. The importance of correct analysis of fuel is recognized. Every step in blast furnace practice is based upon the analysis of the chemist. A similar course is of advantage to the foundrymen, modified by the different conditions, but it must be joined to good judgment and experience.

It has been said that figures will not lie, but the figures of a coke analysis do frequently deceive, partly because the analysis may not be correct, and partly because we may only imperfectly understand what it says. The analysis of coke is too often deceptive because the sample is not properly selected and is not an average of the fuel. Therefore, it may show the coke to be poorer than it is or better than it is. Probably the latter is more often the case. The method of the analysis may be wholly correct, but the theoretical conditions under which it is made may not show what it can do in the foundry, unless we know enough to read between the lines. The analysis that gives the total amount of ash in a coke is not always sufficient. The constituents of the ash are as often as necessary, since they may be of such character as to produce a change in the molten iron, and may have more or less bearing upon the flux that should be used. There is, from time to time, some variation in the same coke, that results from the varying conditions attending the burning, and some variation in the coal. What all these small variations are that produce this effect we do not fully know. It results from this that more than a single analysis is desirable.

The cokes that come to this market and to the West generally show a wide diversity in the analyses. This may be the case, and yet all the cokes may be good in their proper places. They contain from 87 to 92 per cent. of fixed carbon, from 6 to 12 per cent. of ash, and sometimes as high as 17 per cent., and from .6 to 1.25 per cent. of sulphur.

For foundry use, the higher the percentage the better, provided it does not contain too much sulphur. The amount of

*Read before the Western Foundrymen's Association, Jan. 24, 1894.

sulphur that can be safely used seems to be uncertain, or, rather, opinions and results vary. The general belief seems to be that 1 per cent. is the maximum, but I have heard men of much experience say that 1.25 per cent. is the limit. The cokes most generally used here contain from .75 to 1 per cent.

The proper amount of ash is an unsettled question, and the belief seems to be gaining that while too much ash clogs the work, it is as bad to have too low an amount as too great. The constituents of the ash are undoubtedly a factor in the question. With our limited knowledge, we may say that probably there should be a suitable balance of proportion of all constituents of coke, and we know that the character of the iron and the flux are factors in the problem. We do not understand very fully the cellular structure of the coke. Upon it, however, depends the strength and also the perfectness of combustion. Whether it can be varied, and what amount is best, is, I think, an unsolved question. A gentleman of much experience claims that he can vary the structure of the coke at pleasure. It certainly is modified by the preparation of the coal—the more finely divided the coal, the more dense the coke. It is also influenced by the amount of volatile matter in the coal, or by the amount of free hydrogen.

It is evident that there is a wide field for research in the coke industry. It is gratifying to see that the belief that any coking coal, a bee hive oven, and the application of heat must turn out a salable coke, is weakened of late. It is but just to say that there have been some notable exceptions among coke manufacturers. The average of coke to-day is certainly higher than it was a few years ago, but this does not mean that there is no need of greater and better results. The average of American cokes is higher than the average of European cokes, though the best of the English coke is probably more effective than our best. The richness and extent of our coal fields, the comparatively good fuel that comes from our ovens, with the minimum of trouble and expense, has withheld the incentive for improvement that exists in so many other industries.

From one point of view, the use of coke in foundries is a small question; but when we consider the great variety of ores and iron, the same variety in fuel, the limited knowledge we have of the chemical and physical changes that are brought about in the cupola, and the inter-dependence of all steps leading up to the finished castings, the subject becomes a large and complex one.

In the operation of a blast furnace, and in the whole process from the mining of the ore to the casting of the pig and the finished steel, practical skill goes hand in hand with theoretical knowledge. The judgment of the worker is supplemented by the training of the student. I see no reason why, in foundry practice, the same conditions do not exist. Every experienced foundryman is a better workman when he adds to his practical training theoretical knowledge. This scientific training is but the practical knowledge of those who have gone before us, classified, sifted and preserved for those who may use it. The foundryman who unites his personal experience with the experience of others, obtained by personal contact, within the walls of technical schools, or from the pages of the book, will use his materials most economically, will make the fewest failures, will secure the most uniform results; in short, will do the best work.

A somewhat extended experience has shown that there is a lack of accurate knowledge in much of the foundry work, that is responsible for many expensive failures, such as come so often, rather than inferior materials, to which it is so often charged. There seems to be in this industry what has been so often, and I may say generally, found in all industries—a tendency to get into a rut. With reference to coke, there have been many amusing and many annoying illustrations of this fact. A few years ago, because of a strike, the coke produced at certain ovens could not be had, and new and untried cokes must be used. This new coke was used by three different foundries not far from here, all doing the same kind of work, under apparently similar conditions. One foundry reported the coke entirely satisfactory, and continued its use. Another declared the fuel a total failure; that the iron was white and the castings inferior. The third foundry, located not more than 200 yards from the second, confirmed the experience of the first, and has continued to use the coke. Similar instances, different in details, but involving the same principle, could be cited at length. What is the explanation? It would seem to be that there is a want of method, an absence of knowledge outside of the groove in which the work has been running. So long as the work is done in the customary way, the results may be satisfactory, but if any of the conditions are changed, the whole system is out of joint.

Another instance is a type of many. In a large foundry this test was made: A new coke was bought and put in for use. The foundryman objected to any change, and the new coke, though one of the standard brands, was pronounced unsatisfactory in most respects. Then the same coke was sent down under the name of the coke that had previously been used. Then everything went smoothly, and the coke was what was wanted. In both cases the coke was identical, as were all the other conditions.

From the time the ore is taken from the mine until the finished casting or forging leaves the shop, iron and coke are most closely connected. The former has been evolved by the application of all the chemical resources of science. The expansion of the iron industries has brought into use a great variety of ores and many grades of iron. To so great an extent is this true that a new grading of iron based upon a chemical analysis is urged. This fact brings out a point in the use of coke. From time to time complaint is made that coke is high in sulphur, making the iron white, hard and weak. In many cases the complaint may be just, but I am certain that in many others the coke is guiltless. The analysis of iron is fully as important as that of coke. A few years ago one of our large Western foundries reported that the coke sent to them was bad, and that it could not be used. An investigation made it clear that the castings were bad, white and chilled. The same coke was in use at an equally large foundry at some distance from there. This foundry while placing a just estimate upon practical skill, had made it a rule that everything that went into the cupola must be analyzed, and a record kept. This record showed that the coke had been all right, showing only the usual average of sulphur. Inquiry developed the fact that at the foundry making the complaint no such system of analysis was in use. The inquiry carried still further made it quite certain, to me at least, that the whole trouble was in the iron though the coke bore the blame. Your own experience will probably furnish similar cases; sometimes it is silicon in the iron, sometimes it is sulphur in the pig, sometimes phosphorus, and sometimes it may be the flux, but coke is too often the vicarious sufferer.

The heart of the foundry may be said to be in the cupola. Most of the troubles that come originate there. There is no part of foundry work that demands such close and intelligent care. If the cupola is not in proper condition or not adapted for the work, if the iron is not of proper grade, if the coke is too light or too impure, if the flux is unsuitable, if the blast is too intense or too weak, if the supply of air is too great or too small, the effect will be seen in the finished casting. The overlooking of one small point may spoil the whole work.

To lay down a rule or set of rules for the use of coke in a cupola is not possible. The efficiency of the furnace depends upon the proper adjustment of the parts, and the accurate working of all to one end. It is necessary to be personally acquainted with the cupola and the blast furnace. A man who was practically and theoretically familiar with a certain blast furnace, once said when many miles distant from it, "If you will tell me the condition of the atmosphere, the strength and direction of the wind at the furnace to-day, I will tell you what grade of iron is being produced." This claim was in a large measure justified by test. The chemical reactions that take place in the cupola are imperfectly understood. We know enough, however, to appreciate the importance of a full knowledge of the constituents of iron and coke and it may be added there should be a similar knowledge of the flux that is used. Only by such knowledge can the proper kinds and proper proportions be known. The use of an improper flux and even the excess of a suitable one may produce the same effect that excess of sulphur in coke or iron does. To what extent iron will absorb sulphur from the fuel is not known, but where the coke contains 1.5 per cent. and probably 1.25 per cent. the iron will be deteriorated. It is probable that a better understanding of the reactions of iron, coke and flux will make it possible to use without injury a coke higher in sulphur than is now thought possible. Some recent experiments have been made in this direction, but nothing definite has been reached.

Apparent progress has been made, however, in methods for the elimination of sulphur from the molten iron, which may have a bearing upon our problem. Another factor in cupola work that most closely affects coke is the blast. It has been clearly demonstrated that the use of hot blast saves fuel but the working of most foundry furnaces is so intermittent, that its use is hardly feasible. It has seemed that too many foundrymen fail to appreciate the real necessity of the proper adjustment of the air supply that enables the coke to do its work. The pressure of the blast should be sufficient and the amount neither too great nor too small. There is a waste of both coke and iron in either case. If the pressure and amount of air are not enough, the melting will be retarded; the fuel will be consumed, but will act too slowly; the metal is deteriorated, runs thick, and the castings are inferior. If the blast is too strong the coke is consumed too rapidly, and a portion blown out unconsumed. The intensity of the heat beyond what is needed, hardens the iron, is apt to induce chemical action between iron and the impurities of flux and coke, and cause the thin liquid slags to attack the lining. Thus the full value of the coke is utilized only with the proper intensity, amount, and uniformity of blast. The blast, moreover, must be regulated by the character of the iron, of the coke and the flux. If the coke used is hard and firm the blast should be stronger than if a lighter and more porous coke be used. Many a good coke has failed because the blast was not properly regulated.

It is an error to suppose that sulphur can be burned out by intensity of heat. The analysis of gases escaping from blast furnace chimneys shows no sulphurous vapors and I think none containing phosphorous. Upon the same principle in burning coke about one-half of the sulphur of the coal is driven off if the heat is regular and not too intense. If it be too intense, the sulphur seems to have chemical affinities developed that cause it to enter into combinations upon which the heat has no effect.

It will naturally result from what has been said that from inattention to details there must be a large waste of coke in cupola work. The loss through breakage in transit and careless handling is small compared with that due to faulty methods. In England the average consumption of coke in cupola work is 280 pounds, with a minimum of 175 pounds per ton of iron melted. In this country the best practice puts the minimum between 150 pounds and 225 pounds, though this is perhaps too small. What the average is I cannot say. In what has been said in a general and rather desultory way, the object has been not to criticise, but to call attention to those more obvious points in foundry practice that may be improved as it appears to a layman. The use of coke is so intimately bound up with all other materials that enter the cupola and one so depends on the others that no rule of action be formulated for one that does not apply to others. Considering coke alone, we can say that so far as we now know it is the best fuel for the melting of iron in the cupola because it is as a rule more pure and uniform, and when properly used will give the maximum of efficiency. When we ask what the best coke is we can hardly answer in a word. We must take into account the kind of work to be done, the iron to be used, the flux that is best adapted, and the conditions of the blast. We must know in a measure what our iron contains, what are the constituents of flux and coke. We should know as much as we can of the chemical affinities and relations of these constituents. Then we can say with some degree of accuracy whether Connellsville or Pocahontas is best; whether New River or West Virginia will be most efficient and economical.

AT Pittsburg, Keeling, Ridge & Co. entered suit against Thomas S. Blair to recover $1,800 on a contract to build a steel plant at Ashtabula, O. Margaret Keeling, executrix, also sued the same defendant to recover $3,000 on a note. These suits are sequels of the Ashtabula, O., land and steel plant deal of last summer.

THE Tennessee Coal, Iron & Railroad Co. have made new ore contracts, which are equivalent to a saving of 22½ cents on the cost of pig iron.

THE Atlantic mill at New Castle, Pa., resumed, Jan. 29, with orders enough to keep it in operation for some time.

GRAPHITE AS A LUBRICANT.

In a pamphlet bearing the above title, just issued by the Joseph Dixon Crucible Co., the following statement is given of the results of tests made by Prof. Thurston, showing the effect of graphite for lubricating, as compared with oil and grease:

Some years ago Prof. R. H. Thurston, for the purpose of correcting some of the misconceptions that were held with regard to the proper condition of graphite as a lubricant, made a series of tests at Stevens Institute, to determine with scientific accuracy the comparative value of graphite as a lubricant with the various oils and greases in common use. The results of the tests were as follows, and to our knowledge they have never been questioned: 335 milligrams of the best winter sperm oil under a pressure of 48 pounds per square inch ran 11 minutes, 2,000 revolutions per minute, having traveled by rubbing surface 7,198 feet; the elevation of temperature was 175° Fahr.; the average co-efficient of friction, .0555.

A mixture of 120 milligrams of fine flake graphite (absolutely pure) with sufficient distilled water to make it adhere to the bearing, under 48 pounds pressure per square inch, ran 30 minutes, 2,000 revolutions per minute, traveling by rubbing surfaces 19,635 feet. At the 11th minute, when the life of the oil was spent, the co-efficient of friction was .0417, and the increase of temperature was 158° Fahr. The average co efficient was .0596, and the total increase of temperature 194° Fahr.

Three hundred and thirty-five milligrams of the best winter sperm, under a total pressure of 60 pounds, 2,000 revolutions per minute, ran 51 minutes, having traveled by rubbing surfaces 33,360 feet, with an increase of temperature 185° Fahr. The same quantity of graphite grease, which contained but 15 per cent. of fine flake graphite, under a total pressure of 60 pounds, at 2,000 revolutions per minute, ran 293 minutes, having traveled by rubbing surfaces 194,941 feet. At the expiration of the 51st minute, when the oil had been spent, the increase of temperature was 135° Fahr., and at the 103d minute the temperature was 130° Fahr., at the 155th minnte, 142° Fahr.; at the 205th minute, 182° Fahr.; the total increase was 310° Fahr. at the end of the test. An examination of the bearing at the end of the test showed it to be in perfect condition It may be well to add that where graphite was used there was no cutting of the bearings, even where the temperature was very high. It may be proper also to mention that a test made with the grease which was the base of the graphite grease gave no better results than the sperm oil.

BRIEF SUMMARY OF TESTS.

FIRST TEST.	Quantity in milligrams.	Pressure on bearing per square inch.	Number of revolutions per minute.	Time in minutes till the bearings "squealed"	Total No. of feet friction surface traveled.
Best sperm oil.....	335	48 lbs.	2,000	11	7,198
Dixon's Perfec'd Graphite, mixed with enough water to distribute it over bearings.....	120	48 lbs.	2,000	30	19,635

NOTE.—Under same number of pounds pressure and traveling at same rate of speed the graphite did nearly three times more work than the best quality of winter sperm oil.

SECOND TEST.	Quantity in milligrams.	Pressure on bearing per square inch.	Number of revolutions per minute	Time in minutes till the bearings "squealed"	Total No. of feet friction surface traveled.
Best sperm oil.....	335	60 lbs.	2,000	51	33,360
Best quality of lubricating grease.....	335	60 "	2,000	51	33,360
Same grease containing 15 per cent. Dixon's Perfected Graphite.....	335	60 "	2,000	293	191,941

NOTE.—The grease without the graphite gave no better results than the sperm oil; but when 15 per cent., by weight, of Dixon's perfected graphite was added the bearings were run nearly six times longer at the same high rate of speed. Furthermore, where the graphite was used there was no cutting and the bearings were in perfect condition.

Time for the Railroads to Come Down.

TO THE EDITOR OF THE IRON TRADE REVIEW.

We note in the last issue of *The Iron Trade Review* a report of sales of Connellsville coke at 85 cents per ton. The freight rate from Connellsville to Marietta, O., still remains at $2.20 per ton. Can not something be done to make the Interstate Commerce Commission of some practical use to the people for whose benefit said commission is alleged to have been created? We might try to put up with a little free trade if we could have some protection within the United States.

Yours respectfully,

Marietta, O., Jan. 27, 1894. PATTIN, HALL & PATTIN.

MACHINE SHOP AND FOUNDRY

WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular meeting of the Western Foundrymen's Association was held Wednesday evening, Jan. 24, at the rooms of the Detroit Foundry Equipment Co., 225 Dearborn st., Chicago, Ill., the president, Mr. George M. Sargent, in the chair.

Among those present were the following: Messrs. Geo. M. Sargent, The Sargent Co., Chicago; H. S. Vrooman, Garden City Sand Co., Chicago; C. A. Sercomb, Schwab & Sercomb, Milwaukee, Wis.; J. Bowie, Walburn-Swenson Co., Chicago; F. A. Rundle, Detroit Foundry Equipment Co.; J. N. Barr, C. M. & St. P. R'y Co.; W. H. Fenner, Jr., Chicago; W. D. Sargent, The Sargent Co., Chicago; J. H. Whiting, Detroit Foundry Equipment Co.; H. M. Lucas, *Industrial World;* C. K. Pittman, Chicago; B. M. Gardner, *Iron Trade Review.*

The following made application for membership, and were unanimously elected as members of the association: Dickman & Mackenzie, 1224 Rookery Bldg., Chicago; W. H. Fenner, Jr., 147 Van Buren st., Chicago.

Mr. W. D. Sargent, of Chicago, presented the following resolution, to be acted upon at the next regular meeting:

"*Resolved*, That Article I of the By-Laws shall be amended to read as follows: The regular monthly meeting of the association shall be held on the third Wednesday of each month, at the rooms of the association, at 2 o'clock P. M."

Mr. C. K. Pittman then read the paper of the evening, entitled, "Coke in the Foundry." It will be found in full on other pages of this issue. The discussion was as follows:

Mr. J. N. Barr: There are a good many points in the paper, Mr. Chairman, which bring up ideas that are quite important. I would like to ask one question: On what grounds does Mr. Pittman claim that coke is better fuel than anthracite coal for cupola work?

Mr. Pittman: I do not know that I can answer that question, partly because I am not particularly familiar with the use of anthracite coal, only to a very limited extent; but I think it is essentially true that the best grade of coke is better than the average grade of anthracite coal. I believe that coke is more easily regulated than anthracite, and more uniform in its qualities. I might also add that the difference in the nature of the two fuels, when they are properly treated, will insure more perfect combustion in the coke than in the anthracite coal.

Mr. Barr: I have had a very large experience with both, and as a result of that experience, without going into details, I would say that with fine grade work anthracite coal will make better, softer and finer castings. That is, the castings are softer and the iron more fluid, and it retains its fluidity longer in the ladle with coal than with coke. But in this Western country the difference in the cost in using coal and coke is so great that I do not know that it would pay to use anthracite coal, except for special purposes.

Mr. Pittman: To what do you attribute this difference?

Mr. Barr: I scarcely know. The anthracite I was accustomed to use was freer from sulphur. Coke is more open, the blast passes through more easily, and it will melt the iron more rapidly and make an iron which will chill more quickly, passing from the limp condition that is proper for fine castings into a condition approaching mushiness. There is no doubt that that is true. Whether it is due to a greater amount of sulphur, I do not know. At the same time, anthracite coal will require twice as much blast pressure to melt the iron as coke, and the iron will not run out as fast. Our practice out here is to mix anthracite coal and coke, half and half. The coke keeps the bed of coal open. I think we get a less amount of sulphur, less deterioration of the molten iron than in using coke alone.

Mr. Pittman: Do you mix the coke and anthracite throughout the entire charge?

Mr. Barr: Yes, sir.

Mr. G. M. Sargent: What is the anthracite you use, Mr. Barr?

Mr. Barr: The anthracite we have been using is the Cross Creek coal. We have also used the Honey Brook coal and the Pardee coal.

Mr. J. H. Whiting: Did you ever have these coals analyzed?

Mr. Barr: No, sir. Mr. Pittman spoke of the raw ends of coke. I made an experiment with that with a little cupola I had. I broke a lot of pigs, and put one-half in one pile and one-half in another, so that one half of each pig was used in each of the results. I then sorted out a lot of the clearest, densest coke and a lot of the black ends, and melted the two lots of iron in as nearly similar circumstances as possible, and took chill tests of the resulting mixtures. The result was, as near as I can recollect, that the iron melted with the clear coke chilled one-fourth of an inch, and that melted with the black ends chilled pretty nearly one-half of an inch.

Mr. Whiting: How many experiments did you make?

Mr. Barr: Two.

Mr. Pittman: I would like to say that the cases to which I referred were not carried on to any great extent. I observed in one place, where they had kept the analyses of coke, that black ends gave the better analysis. I was surprised at it. I have been very much interested in the question. I am inclined to think there is a prejudice against the black ends.

Mr. Barr: There is this to be taken into consideration in the matter of results in every foundry: Here is a foundry working with a mixture of metal that has as much sulphur in it as it will stand; if they use a coke with a large amount of sulpur in it, that is the last straw that breaks the camel's back. At the same time, a foundry using a lot of iron that is lower in sulphur and probably high in phosphorus, can use coke that introduces an increase of sulphur, and not notice any effect whatever. It seems to me that two foundrymen can get contrary results of that kind and be perfectly correct in the position they take. The results are really not contrary.

Mr. Whiting: Do you not think that comes largely from the coke not being uniform? A great many coke producers turn out coke that is not uniform.

Mr. Barr: I think there is a great lack of uniformity in lots of coke from the same place. I do not know whether it is a difference in density or chemical composition. The preparation of the cupola with anthracite coal is much more uniform than with coke.

Mr. Whiting: It is difficult to get anthracite coal out here. I think coke will stand a greater number of re-meltings.

Mr. Barr: The question is, is coal a better fuel for cupolas than coke?

Mr. Bowie: I have had a little experience with anthracite coal, but we do not use it altogether, and we do not adopt quite the same method as the gentleman here. We do not mix it. We made our beds of Lehigh lump coal, about 20 tons. We found that when we had light heats, all coke was better; but for heavy castings, like general machinery castings, we found the coal better.

Mr. Vrooman: Stove plates can be run better with iron melted with coal than with coke.

Mr. Sercomb: When coal is coked in a heap, what part of the heap makes the best coke—the interior, or the outside?

Mr. Pittman: Coke comes out of the ovens averaging almost the same.

Mr. Barr: In our melting with all coke, I found that the iron chilled more rapidly.

Mr. Pittman: I do not understand the matter of the iron cooling off more rapidly.

Mr. Barr: I do not mean to say that the iron cooled off more rapidly, but it thickened more rapidly. It probably thickened at a higher temperature.

Mr. Pittman: Is there a difference in the color of the molten iron with coal from that with coke?

Mr. Whiting: It is redder with coal.

Mr. Barr: In a large portion of my work, we had to pay a great deal of attention to the hardness of the metal, and the variation of the hardness in cooling made itself very quickly manifest. I found that with coke it was necessary to blow with but little over half the pressure it is necessary to use in melting with coal.

Mr. Pittman: What was the difference in intensity of heat, if any?

Mr. Barr: I could not say.

Mr. Bowie: We had one class of work in which our experience was similar to that. I think I can bear you out in that. We did a great deal of experimenting to get the proper mixture to keep it from cracking. The parties that made it before us claimed that they had a two-inch chill and did not get a crack.

When we chilled an inch, it came near coming apart. changed the fuel, and when we melted with coal it did not chill so deep. When we came to test the iron, it was no good. It did not have as deep a chill, and was no good because it would not crack. It was not good when it did crack, and was not good when it did not crack.

Mr. Barr: I should think that stove plate work would show the difference quite distinctly.

Mr. Vrooman: I could generally find I could chill stove plate iron down to the color of an orange, and get a good result.

Mr. Barr: In other words, iron melted with anthracite coal retains its fluidity at a lower temperature than when melted with coke.

Mr. G. M. Sargent: To what do you attribute the difference?

Mr. Barr: I am inclined to think it is a little increase in the sulphur when melting with coke, as compared to melting with coal. I think the coke, with its open structure and free admission of cool air, would have a tendency in melting the iron to produce more oxidation than coal would. I do know this, that manganese is said by chemists to be a deoxidizing material. I know I can take an iron that will chill an inch deep, and, by adding one-half of one per cent. manganese, produce a result that will not chill more than half that deep.

Mr. Pittman: How does it affect the iron?

Mr. Barr: It makes the iron a darker color and better looking iron, and makes it stronger. I made one little experiment that might be interesting to you. I picked out four wheels that were about as weak and brittle as I could find. I put them under a little drop of one hundred pounds. A piece was broken out of the weakest wheel with three blows, the strongest stood nine blows, the average of the four was seven blows. I melted these four in a test cupola without any addition of iron whatever, and obtained in the fluid metal enough to pour three wheels. I poured one wheel without the addition of anything, but I added one-half of one per cent. of manganese to the two other wheels. The wheel that was poured without the addition of the manganese we could not knead. It came out in three pieces. With the other two wheels, one took 85 blows and the other 135 blows to break. Now remember, in the original wheels the strongest took only nine blows. What did it? My idea is that the chemical action of the manganese removed the oxide.

Mr. Fenner: It might be a change in the silicon. I think it changes the graphitic form. It strengthens the iron.

Mr. Pittman: What effect did you find the manganese had upon the silicon?

Mr. Bowie: It strengthened the iron very materially.

Mr. Pittman: I was told of some experiments to show the relationship between the amount of sulphur and the amount of silicon. There seemed to be quite a relation. The silicon seemed to reduce the amount of sulphur.

Mr. Fenner: I have had more experience with Fulton Lehigh than with coke. I like it better. I think it makes a stronger, more uniform casting.

Mr. Barr: It is an accepted fact that sulphur has a tendency to reduce the amount of graphitic carbon and then produce a higher chill; and if coke introduces more sulphur into the iron than Anthracite coal then possibly the increase of sulphur would explain the difference in the chill.

Mr. Vrooman; Does sulphur harden iron?

Mr. Barr: Yes, sulphur hardens iron and makes it chill differently.

Mr. Vrooman: I have a piece of iron that could not be drilled but when a piece of sulphur was put upon it it could be drilled.

Mr. Barr: In that case you produced sulphite of iron. Sulphur combined with iron produces a sulphite of iron that is soft and mushy.

Mr. Pittman: I know a case where a foundry had been using coke and had a good deal of trouble with their castings. They made an analysis of the coke and found a high per cent. of sulphur. They changed their coke and the iron came out all right.

Mr. Sargent: I would like to ask what amount of sulphur is eliminated by coking?

Mr. Pittman: It is generally considered that about one-half if the method of coking is carried on properly, not too rapidly. But when the coking is carried on too rapidly and the heat too intense, a portion of the sulphur is driven off but not so much. Probably intense heat produces some chemical action that holds the sulphur in the coke.

Mr. Fenner: Would coke give it off quicker in the cupola than coal?

Mr. Pittman: I don't know; it is a question.

Mr. Barr: The sulphur must be given off some way when the coal is consumed.

Mr. Pittman: I think it would be worth while to try the effect of combined manganese on the sulphur.

Mr. Barr: So far as my experience goes, the manganese has no influence on sulphur. It is on the oxides that would happen to be formed.

Mr. Pittman: Have you any idea what that action is?

Mr. Barr: It is a chemical interchange that takes place in which the oxidation passes to the manganese and passes off as slag. I believe that is the explanation. Manganese, however, is like sulphur; by increasing the manganese you get a brittle casting. With 600 pounds of ordinary iron you can use as high as three pounds—one-half of one per cent.—without injury. Apparently all that three pounds is combined with oxygen and passes off as slag.

Mr. Sargent: Suppose you wanted to increase the chill, without regard to other properties, what effect would it have upon the iron?

Mr. Barr: It would increase the depth of the chill. I am afraid of manganese. It is one of the most deleterious materials in wheels. I made one hundred wheels and I put in one-half of one per cent. of manganese. I found that the wheels were strong but they did not make but little over one-third of the average mileage. I was a good deal interested in that subject at one time.

Mr. Sercomb: I would like to ask Mr. Pittman what amount of tar is abstracted from coke, and if to any extent it is saved and disposed of. The reason I ask this question is that coke is cheapening up.

Mr. Pittman: I do not think any of the coke ovens save any of the by-products. I believe they are doing so some in the South, and in Europe they save the ammonia to some extent.

Mr. Barr: Will a ton of coke produce as much heat as a ton of coal?

Mr. Pittman: I do not know; I should say probably not. I think, however, that coke will make a more intense heat.

Mr. Barr: In burning a ton of coal do we not get a certain amount of heat from the material driven off in addition to what we get from the carbon that is in the coal?

Mr. Pittman: I think we may. The amount of heat that is generated in the ovens represents that amount of heat. A ton of coal will produce about thirteen hundred pounds of coke.

Mr. Barr: What is the difference in volume between a ton of coal and a ton of coke?

Mr. Pittman: In 72-hour coke the volume is a trifle more than the coal. The coke has a structure that is fifty per cent. of air space that does not exist in the coal.

Mr. Barr: There is another charge I have against coke and that is this: Owing to the porous structure, it will absorb a large amount of moisture and in fact absorb so much that it will make quite a difference in the operation of the cupola.

Mr. Pittman: Coke that is used in the neighborhood of the oven is affected more than cokes used here. In transit a large amount of the water is evaporated.

Mr. W. D. Sargent: That would depend upon the weather.

Mr. G. M. Sargent: What is the difference in melting with one hundred pounds of coal and one hundred pounds of coke.

Mr. Pittman: I cannot answer that question.

Mr. Barr: My experience is that anthracite coal will melt about six pounds, and coke from six to nine.

Mr. Sargent: The charge from the ovens is drawn out by hand, is it not, at the present time?

Mr. Pittman: There are now coke drawers that can work more rapidly.

Mr. Sercomb: A man in my office made this statement; that he had just as good results with 48 hour coke as with 72 hour coke. In fact, he said the supply of 72 hour coke was limited, and for that reason it was more sought after.

Mr. Pittman: There is one thing about the black ends. They may be lumps of coal. In some places they use a pulverizer and there may be some lumps that are not thoroughly

converted. A poor coal will make a better coke when pulverized.

Mr. Sercomb: Do you suppose coke could be made from the Kansas coal?

Mr. Pittman: It probably could if the quality was good enough.

Mr. Sercomb: It is a coal that is used a great deal by blacksmiths. It is very free from sulphur. It lies cropping out of the ground. It is a great coal for generating steam.

Mr. Vrooman: Did you say if iron was melted too hot it would harden it.

Mr. Pittman: Yes if it is melted too hot I think it will harden it.

Mr. W. D. Sargent: In regard to iron melting with certain kinds of coke. Does that depend largely upon the sulphurous qualities of the coke?

Mr. Pittman: It is affected by it to some extent, I think.

Mr. W. D. Sargent: Provided you were not particular about the results, would it be just as economical to use the high sulphur coke?

Mr. Pittman: I think you would melt a little more iron.

Mr. W. D. Sargent: Do you place the maximum results at 250 pounds?

Mr. Pittman: I said 125.

Mr. Bowie: Lime has been used some in the coke ovens to take out the sulphur.

It was moved and carried that a vote of thanks be extended to Mr. Pittman for his excellent paper.

The meeting then adjourned.

MACHINE SHOP MANAGEMENT.

We find making the rounds of the press the following item

"Business is a profession, as much so as medicine or law It requires as much thought, study, care to make it successful to make it pay. It wouldn't be good business if it didn't pay. And it isn't good business if it doesn't pay in the right way."

Most of this means simply that, in business, as in other occupations, men can usually find use for all the brains they may have at command. But regarding the statement that, "It wouldn't be good business if it didn't pay," we wish to call attention to the fact that on the other hand, business which pays is not necessarily or always good business. Especially is this the fact as applied to the business of running machine shops; for a machine shop may and many of them actually do pay, while really under very poor business management; though, of course, they would pay better under better business management.

Whether a machine shop pays or not will depend mainly upon what price can be obtained for its finished products relative to their cost, and there are, therefore, two principal ways of increasing profits; either better prices may be obtained or cost of production lowered. It often happens that by reason of patents, absence of competition, extraordinary mechanical and engineering ability, or some other reason, a machine shop will run along and make money in spite of business management that would inevitably swamp any less favored enterprise, and one point of the matter is that in such cases those who are responsible for the business conduct of its affairs are quite apt to conclude that it is their own skillful business management, and nothing else that keeps things going.

We have in mind one shop, the superintendent of which was for years a member of the firm, who knew about as little of mechanical matters as a man could well know. The shop manufactured, on a large scale, a patented machine, which, meeting very little competition, brought a very high price. The shop was managed literally upon the principle that a penny saved is a penny earned. Barely enough room was added from time to time to just permit the work to be got out by the utmost crowding. The power plant was simply a patch work in which absolutely no engineering ability had been employed. Wherever ten cents could be saved by skimping in making a special or shop tool it was done without much regard to whether the extra expenditure would pay in increased efficiency or not.

The machine tools were of the cheapest make of the lowest priced builder, and when cleaned at all were cleaned with rags bought of the rag dealers, or brought from the house of the manager; some of the time of the men being devoted to the formation of parades, fantastically decked out in cast-off articles of feminine attire thus obtained. There was no tool room nor drawings, shop system nor cost accounts, and yet large fortunes were made for the proprietors.

The system of bookkeeping and accounts in the office was excellent; the proprietors were "business men," and therefore knew enough to employ a good bookkeeper who drew a salary about five times as great as that of any mechanic about the place, but there was not sufficient business ability to enable it to be understood that mechanical matters can be well managed only by men who, whatever else they may be, must be mechanics.

But after a time competition grew sharper, prices fell and profits disappeared; that shop closed, and the one which absorbed most of its business and is to-day making money for its proprietors with constantly increasing competition pays its manager—a mechanic—several times as much as the chief bookkeeper gets, and there are other expensive things such as drawings, a model tool room, the best tools, cotton waste, etc.

Now although this is directly due to good mechanical management, it is primarily due to that kind of good business management which recognizes that professionals generally do better and cheaper work than amateurs or novices; that a skilled carpenter earning $3 per day will build a wood shed at lower cost than a botch at $2 or a laborer at $1, and that it is true of labor as of many other things, that the highest-priced is usually the most economical.

It would be well for those who have to do with successful machine shops to consider well what it is that gives them success, and a rigid examination on this line might not only lead to some surprises, but be useful when competition increases and prices fall.—[American Machinist.

FOUNDRYMEN'S ASSOCIATION.

The Thirty-third meeting of the Foundrymen's Association, Secretary Evans writes us, will be held at the Manufacturers' Club, Philadelphia, on Wednesday evening, Feb. 7, at 8 o'clock.

Mr. W. J. Keep, superintendent of the Michigan Stove Co., will present an address on "Foundry Chemistry," in answer to an address made by Mr. E. A. Wheeler, of Sharon, Pa., on "Furnace vs. Foundry Practice," before the Western Foundrymen's Association at their November meeting. Mr. Keep says in his paper, "I am only defending present practice, which is the survival of the fittest." A paper by the James Reynolds Mfg. Co., of New Haven, Conn., on "Molding Machines," will be read.

A statement of the condition of the foundry trade will be presented by the chairmen of the various sections representing the different branches of the foundry business.

HOISTING MACHINERY IN THE SHOP.

We make extracts as follows from an article on "Hoisting Machinery" and its uses in shop and foundry, prepared for *Dixie* by J. H. Allen:

There is probably no non-productive machine about a shop that earns as much, to put the matter paradoxically, as the crane. When we see a group of men working until every muscle is strained to the very limit of its endurance in attempting to lift a heavy casting into position on a lathe or planer, all in default of a suitable hand hoist wherewith one man could do the work in one-tenth the time with one-thousandth the actual exertion, we are disposed to look upon the proprietor of that shop as being an old fogy who is so far behind the times that it is a hopeless task for him to so much as make the attempt to catch up.

There is no shop so small, no business so poor that should not have its complement of cranes and hoists. First of all there should be the self-sustaining hoist with a capacity equal to the heaviest of the probable requirements. When we come to the cranes, they may be a simple ring in the ceiling into which the hoist is to be hooked, or the elaborate traveling crane. But for the small shop there are a multitude of simple designs that can be made at a low cost and which will serve their purposes most admirably. The most common is the straight bar, slightly curved up at the outer end and suspended by a stay to the post about which it swings. Old railroad iron

seems to be the most suitable material for such a swinging jib. It has the advantage over the plain flat bar in that the head and flange give it a lateral stiffness, so that it is not likely to buckle and the unnecessary metal which it contains receives a compensation in the very low price at which it can be bought. Such a jib can be hung to a post or to the wall, the only care that need be taken is that the horizontal pull should be carefully calculated so that it may not exceed the resistance of the wall and pull it down. It seems superfluous to call to the attention of our readers, that the greater the distance between the point of attachment of the upper end of the stay and the heel of the jib the less will be the horizontal pull on the wall.

Sometimes, however, there is no post or pillar near at hand and the jib must be held by its own swinging post. Belts and machines may be thickly strewn around, and yet when the trolley cannot be made to serve, the swinging jib crane can usually be worked. It goes without saying that there must be some space in the floor and the ceiling above for stepping and fastening the post. So we first locate this and then proceed to put in the longest jib that will swing over the desired arc and clear the belts. Of course this is not long enough to pick up our work and put it where we want it; so we devise an extension jib. This can be done by building our main jib in two parts and carrying a set of rolls flush with the bottom and top and running our extension between the two parts and taking the upward and downward thrusts on the rollers. If they are well put up and kept level one will be surprised at the ease with which the heavily loaded extension can be worked in and out, and the load swung in and around the belts, that at first sight would seem to preclude all possibility of the use of a crane.

When we pass beyond the domain of the simpler tools, it is doubtful if it will pay any proprietor to construct his own hoisting tools, unless he does it to keep his men busy in a dull season and to avoid breaking into the efficiency of his working force. If the need arises for a peculiar construction of crane for doing a special piece of work, it is probable that some one has had the same need before and that the shop of some crane builder will have the pattern to furnish just exactly what you want. The height of hoist, the weight to be hoisted and the power available can all be combined, and the result will be a tool especially suited to your wants.

The first travelling crane with which we had to do was of our own designing and of home manufacture. Its capacity was ten tons and its span 40 feet. A railroad shop received the benefit. It was operated by hand, it moved slowly and the general manager thought it no good. But when he learned that with this infant the time required for putting a cylinder on the planer was dropped from an hour and a half with four men to five minutes with two he looked interested. When the time of taking an engine cab from its place and putting it on the painting scaffold was cut down from three hours to twenty minutes he ceased to gibe at our little tool made of four by six pine sticks; and when he saw a boiler come travelling down the shop far above the impediments of the floor he owned the tool to be a handy one, and before it had been in the shop a year he OK'd a requisition for a power tool that would lift thirty tons and cost a very pretty penny. Such is the educational influence of small things.

The Hubbard Co-operative Mill.

TO THE EDITOR OF THE IRON TRADE REVIEW:

We wish to advise you we are now operating the Hubbard mill on the co-operative plan with very good results. We have been running for the past ten days and our men seem to be well satisfied with this arrangement. We are only running the puddling department, and have orders enough on our books for about four weeks' work.

Yours very truly,

THE HUBBARD CO-OPERATIVE IRON CO.

Hubbard, O., Jan. 27, 1894.

No rail purchases will be made upon a large scale until after the tariff bill leaves the House. After this it is probable that orders will suddenly accumulate, and among other guesses as to the amount of business likely to be placed within a month after that time is a conservative one of 100,000 tons.—[Railway Review.

INDUSTRIAL SUMMARY.

New Enterprises:—

The following recent incorporations, specially reported for *The Iron Trade Review*, are of interest to the iron and machinery trades:

Milwaukee, Wis.—Telegram Cycle Mfg. Co.; capital, $75,000; to manufacture and deal in bicycles, etc.; incorporators: W. H. Wolf, F. R. Pingree, W. H. Mornsen. Address letters care of F. R. Pingree, Milwaukee, Wis.

Grand Rapids, Mich.—Champion Cash Register Co.; capital, $16,000; to manufacture and sell cash registers; incorporators: H. M. Geiger, D. E. Corbitt, Thos. Friant, Grand Rapids, Mich. Address letters care of D. E. Corbitt, Grand Rapids, Mich.

Circleville, O.—The B. T. Hedges Buggy Co.; capital, $5,000; to manufacture and deal in all kinds of buggies, wagons, carriages, agricultural implements, etc.; incorporators: A. D. Rogers, Jr., J. H. Poste, B. T. Hedges, B. E. Poste, Frank C. Smith.

Chicago, Ill.—The Worthington Car Coupler Co.; capital, $100,000; to manufacture and sell the Worthington car coupler; incorporators: A. J. Worthington, Lewis W. Dickerson, Arthur H. Simmes. Address letters care of Jno. Moffett, 911 Ashland Block, Chicago, Ill.

Chicago, Ills.—Artistic Building Works; capital, $50,000; to manufacture the material for and to erect buildings as contractors; incorporators: Richard Schroedter, August Hubert, Otto Haack. Address letters care of R. Schroedter, 566 Sedgwick st., Chicago, Ill.

Milwaukee, Wis.—Charles Abresch Co.; capital, $200,000; to manufacture and deal in carriages, wagons and vehicles of all kinds; incorporators: C. Abresch, A. Hofhen, L. Schueller, Jr., H. P. Ellis. Address letters care of Rogers & Mann, 260 S. Water st., Milwaukee, Wis.

Chicago, Ill.—Crane & Jack Co.; capital, $100,000; to manufacture, buy, sell and deal in all kinds of supplies, machinery and merchandise; incorporators: A. M. Gilbert, Alex. D. MacGill, Robt. L. Tatham. Address letters care of R. L. Tatham, Metropolitan blk., Chicago, Ill.

Cleveland, O.—The Cleveland Bunging Apparatus Co.; capital, $10,000; for manufacturing and selling bunging apparatus and appliances; incorporators: Wm. F. Werle, Albert E. Lynch, Herman H. Lahrheim, Chas. C. Birk, Wm. E. Donnelly. Address letters care of M. D. & L. L. Leggett, Cleveland, O.

Lansing, Mich,—Hugh Lyons & Co.; capital, $15,000; to manufacture and sell Lyon's patent hat conformater, window display fixtures, etc., nickel and brass goods, etc.; incorporators: Hugh Lyons, Homer D. Luce, Elgin Mifflin, Lansing, Mich. Address letters care of Hugh Lyons, Lansing, Mich.

Milwaukee, Wis.—Central Electric Service Co.; capital, $100,000; for manufacturing and dealing in heat regulating apparatus, electrical and pneumatic specialties, etc.; incorporators: Francis Hinton, Wm. F. Powell, Wm. D. Van Dyke. Address letters care of Van Dyke & Van Dyke, Milwaukee, Wis.

Greenville, O.—The Greenville Electric Light & Power Co.; capital, $15,000; for furnishing electricity for light, heat and power; dealing in general electrical supplies, etc.; incorporators: A. W. Rush, A. J. Klinger, A. E. Bunger, Z. T. Dorman, C. E. Wright. Address letters care of A. W. Rush, Greenville, O.

Brooklyn, N. Y.—C. & P. Mfg. Co.; capital, $20,000; to manufacture electrical, steam and other machinery and appliances; incorporators: M. T. Davidson, 43 Keap st., Wm. D. Parry, 188 Carlton ave., Wm. A. Drewett, 43 Keap st., Brooklyn, N. Y. Address letters care of A. G. McDonald, 16 Court st., Brooklyn, N. Y.

Indianapolis, Ind.—Progress Oil Burner Co.; capital, $50,000; to engage in a general manufacturing business, including the manufacture and sale of oil burners and all oil burner fittings and accessories; incorporators: Wm. H. Smith, Wm. T. Barnes, Edward Krause. Address letters care of Wm. H. Smith, Indianapolis, Ind.

Anderson, Ind.—Shields Mfg. Co.; capital, $5,000; to manufacture and sell saw guards and frizzer guards, and to engage in a general manufacturing business; to buy, sell and hold and operate necessary machinery and appliances; to buy and hold real estate, erect buildings thereon, etc.; incorporators: Romeo

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M. Atherton, Geo. A. Shields, Wm. W. Atherton, Anderson, Ind. Address letters care of W. W. Atherton, Anderson, Ind.

Chicago, Ill.—Smith Locomotive Fire Kindling Co.; capital, $100,000; for manufacturing, operating and selling kindling for locomotive and other furnace fires; incorporators: Chas. T. Smith, Adelaide F. Fairchild, C. G. Fairchild. Address letters care of Glenn E. Plumb, 914 Monadnock Block, Chicago, Ill.

Chicago, Ill.—San Gabriel Water Co.; capital, $4,000,000; for dealing in water works, property, rights necessary for constructing reservoirs, tunnels, pumps, machinery for irrigation and furnishing power, etc.; incorporators: S. D. Wilson, R. C. Fergus, E. B. Smith. Address letters care of E. B. Smith, 59 Dearborn st., Chicago, Ill.

Indianapolis, Ind.—Commercial Wheel Co.; capital, $200,000: for the purchase and sale of wheels for vehicles and all materials used in the manufacture of same; incorporators: Crawford Fairbanks, Terre Haute, Ind., Dwight S. Smith, Jackson, Mich., T. N. Johnson, Jr., Freeport, Ill. Address letters care of Crawford Fairbanks, Terre Haute, Ind.

Baltimore, Md.—The Guild Mineral Washer Co. (incorporated in W. Va.); capital, $500 min., $100,000 max.; for manufacturing, erecting, selling, etc., machinery used in separating, cleaning, etc., ores, minerals, etc.; incorporators: C. T. Memminger, E. W. Codington, Bartow, Fla.; A. S. Tevean, Baltimore, Md. Address letters care of Julian S. Jones, 9 N. Calvert st., Baltimore, Md.

Chicago, Ill.—Paul J. Daemicke Co.; capital, $75,000; for the manufacture and sale of cooling rooms and refrigerators, hotel, market and grocery furniture and fixtures, meat preservers, lard purifiers, butchers' machinery, etc.; incorporators: Paul J. Daemicke, Jno. Tobin, Will T. Shuening, Henry J. Erzinger, Chas. E. Page. Address letters care of Paul J. Daemicke & Co., Halsted and Fulton streets, Chicago, Ill.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at nce.]

The Crandall Fence & Iron Co., of Sandusky, O., expect for the present to lease a building. Their main want will be wire machinery. They also expect to purchase drilling machines, emery wheels, files, injector, lathe, paint, pulleys, hangers and shafting, twist drills, taps and ties, and punching and shearing press.

P. F. McDonald, of Weston, Va., is in the market for cold storage machinery.

The city of Reedsburg, Wis., will soon advertise for bids on water works and an electric light plant for the city.

The Pine Bluff Furniture Co., E. B. Blom, manager, of Pine Bluff, Ark., is in the market for a boiler and engine.

The Board of Public Works of Jackson, Mich., have been authorized to advertise for bids on two boilers for the Jackson water works.

John M. Moore, engineer and superintendent of the water works at London, Ont., will receive sealed proposals for additional pumping machinery.

The Batavia Preserving Co., of Brockport, N. Y., are in the the market for a boiler and engine. Address B. F. Gleason, chairman of Business Men's Committee, Brockport, N. Y.

A. B. McMillen, city clerk of Pana, Ill., will receive sealed proposals until Feb. 12 for furnishing the materials and constructing a system of water works for the city. About 754 tons of cast iron pipe, 13 tons of special castings, 75 fire hydrants, two pumps having a combined capacity of 1,500,000 gallons per day, steel stand pipe 20x100 feet and the necessary valves, valve boxes, etc., will be required.

New Construction:—

The Sharon (Pa.) Iron Co. are building a new galvanized iron plant that will employ 20 additional men.

The Wickes Refrigerator & Car Co. has placed an order for 450 new Wickes refrigerator cars of 60,000 lbs. capacity with the Missouri Car & Foundry Co.

The shops of the Baltimore & Ohio at Collinsville, Pa., are to be enlarged this year and new buildings are to be erected to replace some of the present structures.

The bulk of the 800 tons of material bought last week by the Youngstown Bridge Co. for the new buildings they are to erect for the Ohio Steel Co., went to the Cleveland Rolling Mill Co.; the balance to the Carbon Iron & Steel Co.

The Berlin Iron Bridge Co., of East Berlin, Conn., have received the contract for an iron roof for the Boiler and engine

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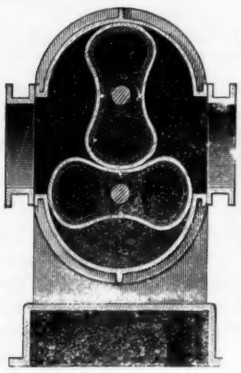

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Correspondence Invited. - - - - - - - - Estimates Cheerfully Furnished.

room of De Land & Co., at Fairport, N. Y. The roof will be covered with anti-condensation corrugated iron.

The Citizen's Gas Co., of Brooklyn, N. Y., have placed the order for an iron roof for their new producer house, with the Berlin Iron Bridge Co., of East Berlin, Conn. The building is 69 feet wide and 151 feet long, with an iron roof covered with slate.

The Paxton & Vierling Iron Works, of Omaha, Neb., have decided to build a new foundry building. It will be 45x100 feet, either four or five stories high, with a basement, and will be built entirely of brick, iron and steel. Its cost will exceed $100,000.

The Variety Iron Works, of Cleveland, have just completed a bridge near Allentown, Pa., 864 feet long and 18 feet wide. The bolting of the spans, arches, etc., was done by the Allentown Rolling Mill Co. It is one of the longest bridges in the country exclusively devoted to an electric road.

General Industrial Notes:—

The Toledo, O., Bicycle Co. has gone into a receiver's hands.

The Youngstown, O., Bridge Works have contracts on hand that will keep them employed for six months.

The Pennsylvania Steel Works have orders that will run them the present week. About 2,000 men are at work.

Bethlehem Iron Co. stockholders vote, Feb. 14, on a proposition to increase the capital stock from $5,000,000 to $10,000,000.

The Lambert & Bishop wire mill, at Joliet, a branch of the Consolidated Steel & Wire Co., will start up Feb. 1 with 800 men.

With orders sufficient to keep it busy all winter, the New Haven (Conn.) Rolling Mill resumed operations in full last week.

At Bloomsburg, Pa., Wm. Neal & Son, dealers in pig iron, have failed. Liabilities, about $20,000, with assets of about $15,000.

D. June & Co.'s foundry and engine works, at Fremont, O., have started up, after six months' idleness. Over 250 men are employed.

Work in the finishing department of the Lochiel Iron Works, Harrisburg, was resumed last week, giving 75 men employment. The Universal mill of the Central Iron Works also started up.

The Isabella Furnace Co., of Pittsburg, operating the Isabella furnaces, at Sharpsburg, Pa., have made a second reduction of 10 per cent. in wages.

All departments of the Spang Steel & Iron Co., in Etna, Pa., start up this week to run for two weeks, and will furnish employment for 200 men.

It is reported at Connellsville, Pa., that the Cambria Iron Co. has purchased the Hogg farm, just west of the city, and will erect thereon a steel plant.

The puddling mill and one plate mill of the Parkesburg Iron Works, at Parkesburg, Pa., have started up with 100 hands, after being idle many weeks.

The McDaniel & Harvey Co., sheet iron manufacturer of Philadelphia, has added to its plant the machinery, etc., necessary for turning out painted corrugated roofing sheets.

At McKeesport, Pa., about 1,000 men went to work at the terms offered by the National Tube Works. Other departments of the National Rolling Mill gave employment to an additional force.

The Bessemer Steel Works at Troy, N. Y., have closed. The puddlers employed at the Albany Iron Works have not yet reached any agreement as to returning to work at the reduced rates offered by the receivers.

Two tong weld, two bell weld and one lap weld furnace in the tube works at the Riverside Works, Wheeling, W. Va., are going. The entire plate mill, blast furnace at Benwood, and steel plant are also in operation.

No. 2 furnace of the Sloss Iron & Steel Co.'s Birmingham, Ala., plant, produced in the second week in January 1,213 tons, a daily average of 173 tons. It is claimed that this beats records made by any furnace in the South of equal dimensions.

The hammer and boiler shops of the Schenectady Locomotive Works have started with a small force, and other departments will begin soon. The company have an order for three switch engines for the New York Central and two for a Vermont road.

The Arcade File Works, of Anderson, Ind., have just added to their equipment two new machines, of their own design, for

making single cut files. These two machines will increase the capacity of the works for producing these particular files about 80 dozen per week.

On April 4, the 20-year charter of the Thomas Iron Co., Hokendauqua, Pa., will expire by limitation, and a movement is now on foot to have it renewed. The company now has four of its 11 furnaces in operation. A semi-annual dividend of 3 per cent. has been declared.

At Sharon, Pa., notices of a reduction of 10 cents a day were posted at the Alice, Mabel and Spearman furnaces at Sharpsville, last week, to take effect Feb. 1. This brings laborers down to $1.05 per day, and turn men to $1.25 per day. The men accepted the reduction.

The 8-inch and 10-inch mills of the Andrews Bros. Co.'s plant at Haselton, O., resumed, Monday. Other portions of the mill were expected to resume a few days later. The blast furnace that has been banked for a short time, in order to make repairs, starts this week.

At the annual meeting of the stockholders of the Brier Hill Iron & Coal Co., at Youngstown, O., the old directors, George, John and Henry Tod, J. G. Butler, Jr., and H. H. Stambaugh, were re-elected. The directors elected George Tod, president; Henry Tod, vice president; H. H. Stambaugh, secretary and treasurer, and J. G. Butler, Jr., manager.

The large increase in the output of the Colorado Fuel & Iron Co. in 1893 over that in 1892 is shown in the following statement: Pig iron, 1893, 43,047 tons; 1892, 31,231 tons; spiegel, 1893, 2,507 tons; 1892, 1,017 tons; castings, 1893, 2,057 tons; 1892, 1,645 tons; pipe, 1893, 2,486 tons; 1892, 2,066 tons; steel rails, 1893, 40,039 tons; 1892, 24,384 tons; spikes, 1893, 271 tons; 1892, 125 tons; merchant iron, 1893, 5,930 tons; 1892, 4,855 tons; steel angle bars, 1893, 53 tons; Orient ore, 1893, 48,167 tons; 1892, 31,814 tons; Calumet ore, 1893, 26,277 tons; 1892, 13,938 tons.

The Hubley Mfg. Co., of Lancaster, Pa., recently formed with a capital of $200,000 to take up the patents and designs of the business carried on for some years by John E. Hubley, and a partner, will manufacture electric, steam and mechanical toys, indestructible malleable iron and steel toys, cast-iron toys, electric motors, electric apparatus, also specialties in cabinet, stationer's and staple hardware. The plant, including a complete foundry equipment, has been put in readiness, and will be in operation in February, employing 200 people. The foundry has two stories, and is 150 x 40 feet.

The new Florence furnace of the Roane Iron Co., at Rockwood, Tenn., is of the most modern construction, and is calculated to develop the highest efficiency. It is now in full blast, with a daily output of 90 tons, which will be increased to 100 tons. The cost was $200,000. The furnace proper is 16 feet 6 inches bosh and 75 feet high, supported on eight massive cast iron columns, 19 feet high; on this is placed a wrought iron mantle made of channel and eye beams, 12 feet deep; to this is fastened the shell; heavy bands hold the brick work; there are six sets of water plates; eight tuyeres, each 7 feet in diameter; the bottom jacket below the tuyeres is made of 1¼-inch steel plate, and is so arranged that water can be used on it when necessary. There are 15 tubular boilers, three Kennedy stoevs, with six gas burners each, five engines, and three pumps. The plans include the building of another furnace. It is the intention to use two engines on each, the fifth being so arranged as to be available for either.

MIDWINTER FAIR EXCURSIONS.

To California and Oregon at Reduced Rates via Pennsylvania Lines.

On account of the Midwinter Fair at San Francisco, special low rate tourist tickets to that city, as well as to San Diego, Los Angeles, San Bernardino and other winter resorts in California, will be sold via Pennsylvania Lines. Tourists can have the choice of routes from Chicago and St. Louis. Tickets will be limited for return passage until April 30th, 1894. Tourist tickets to Portland, Oregon, valid going or returning via California, are also for sale over this first-class route. For details apply to nearest Pennsylvania Line Ticket Agent, or address F. Van Dusen, Chief Assistant General Passenger Agent, Pittsburg, Pa.

Rates may never be lower

to the South. The Nickel Plate Road now can offer you rates away down account of Land Seekers' Excursion to many of the Southern States. Ask Nickel Plate Agents; their rates are always the lowest.

MR. W. L. Johnson has resigned the secretaryship of the Western Foundry Co., of Chicago, and Mr. M. A. Rourke has been elected in his place, Mr. Rourke having purchased Mr. Johnson's interest in the company. The officers of the company at present are D. F. O'Neil, president; N. F. Purcell, manager, and M. A. Rourke, secretary and treasurer. The company manufactures light gray iron castings, and has a well equipped foundry on Albany ave., near Thirty-eighth st., Chicago, with office at 813 Royal Insurance Bldg.

THE Walburn-Swenson Co., of Monadnock Block, Chicago, have recently closed an important and very large contract for a complete equipment of mining machinery for lead and zinc mines in Missouri. They state also that business with them appears to be improving very materially, and that they look for a considerable betterment of affairs in the near future

BUY a home in the Sunny South, and go now when rates are away down. Ask Nickel Plate Agents for dates; their rates are always the lowest to any place.

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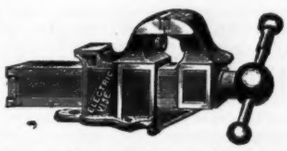

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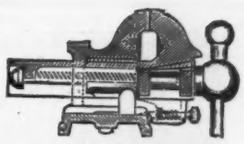
One movement in and out, one turn of the hand and the work is secured.



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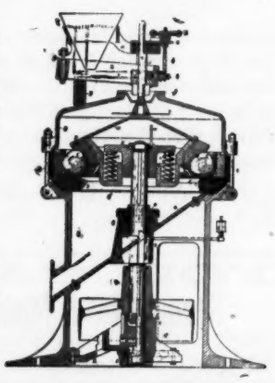

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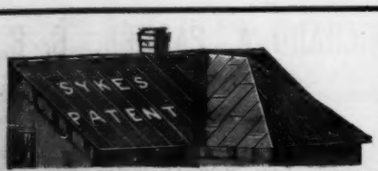

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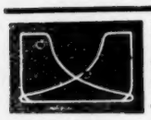

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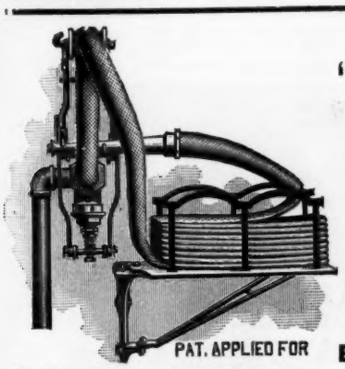

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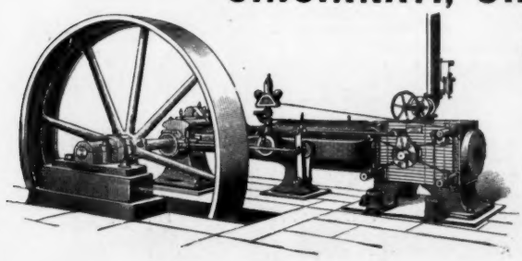

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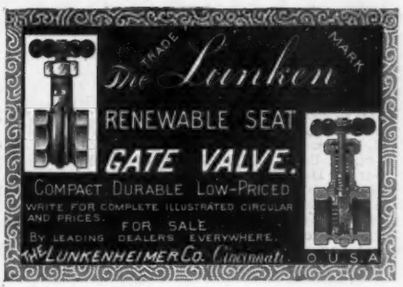

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Pittsburgh, Bellaire and East	† 1.00 pm	† 6.25 pm
Philadelphia and New York	* 1.40 pm	*11.15 am
Baltimore and Washington	* 1.40 pm	*11.15 am
Alliance and Pittsburgh	* 1.40 pm	*11.15 am
Ravenna and Alliance	† 3.25 pm	† 9 50 am
Hudson and Ravenna	* 5 .0 pm	* 8.25 am
Philadelphia and New York	*11.10 pm	* 5.25 am
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Xenia and Cincinnati	* 8.40 am	* 5.25 pm
Akron, Columbus & Zanesville	† 8.40 pm	* 5.25 pm
Akron and Columbus	* 1.00 am	†11.55 am
Akron and Orrville	† 3.25 pm	† 9.50 am
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	Arrive.	Depart.
Akron & Canton	*6:40 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:40 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Garrett	†3:00 P M	†11:00 A M
Wooster		*6:30 P M
Akron, Canton & Marietta	†3:00 P M	†11:00 A M
Steubenville, Wheeling, Washington, D. C., and Baltimore	†3:00 P M	†11:00 A M

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Wm. Tod & Co., Youngstown, O.

Coal and Coke—
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Vulcan Iron Works Co., Toledo, O.

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Greiner Economical Cupola Co., Chicago, Ill.

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Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
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Ejectors—
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Penberthy Injector Co., Detroit, Mich.

Elevators—
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Berger Mfg. Co., Canton, O.

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Van Dusen Gas Engine Co., Cincinnati, O.
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L. Spence & Son, Martins Ferry, O.
Weston Engine Co., Painted Post, N. Y.
Brightman Stoker Co., Cleveland, O.
Wells Engine Co., New York City.
The Brownell & Co., Dayton, O.

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Brightman Stoker Co., Cleveland, O.
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E. K. Morris & Co., Cincinnati, O.
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Garden City Sand Co., Chicago, Ill.
Geo. H. Anderson & Co., Pittsburg, Pa.
Westmoreland Fire Brick Co., Pittsburg, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.

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Buffalo Fire Equipment Co., Buffalo, N. Y.

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Prentiss Tool & Supply Co., Chicago, Ill.
W. F. & John Barnes Co., Rockford, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

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Lake Shore Iron Works, Marquette, Mich.
Wm. Tod & Co., Youngstown, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.

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Detroit Foundry Equipment Co., Detroit, Mich.
Greiner Economical Cupola Co., Chicago, Ill.

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Bickford Drill & Tool Co., Cincinnati, O
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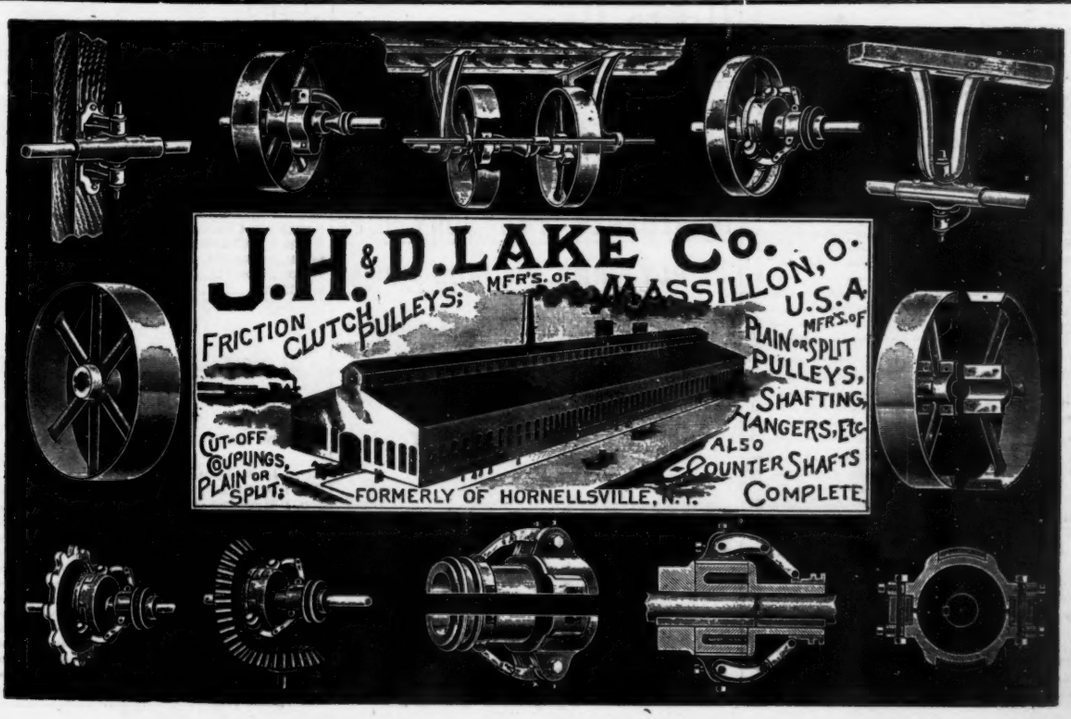
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	PAGE
*Acme Safety Emery Wheel Co	—
Adt, John & Son	28
Adams, C. P.	28
Aitchison, Rob't Perforated Metal Co	27
American Mining & Milling Machinery Co	22
Anderson & Co., Geo. H.	26
Arcade File Works, The	1
Artificial Gas Engineering Co	26
Babcock & Wilcox Co	32
Barnes Co., W. F. & John	28
*Berger Bros	17
*Berger Mfg. Co	—
Bickford Drill & Tool Co	27
Bickford, H.	32
Biedler, Frank R.	29-31
Billings & Spencer Co	2
Brightman Stoker Co	20
*Brownell & Co., The	—
Bucyrus Steam Shovel & Dredge Co	21
Buffalo Fire Equipment Co	23
Buffalo Forge Co	1
Capital Machine Tool Co., The	21
Chester Steel Casting Co	27
*Cincinnati Milling Machine Co	—
Cleveland City Forge & Iron Co	1
Cleveland Rolling Mill Co	23
Cleveland Stamping & Tool Co	23
Cleveland Twist Drill Co	32
Cole, J. Wendell	32
Condit-Fuller Co	30
Connersville Blower Co	19
Consolidated Roofing Works	32
Correspondence School of Mechanics	23
Corrigan, Ives & Co	30
Deming Co	31
Detroit Foundry Equipment Co	23
Dixon, Jos. Crucible Co	21
Downerd & Son Co., The J.	31
Eclipse Electrotype & Engraving Co	2
Fay & Egan Co., J. A	27
Fleharty, J. H. & Co	30
*Foos Mfg. Co	21
*Freeman & Sons Mfg. Co	29
Fulton Steam Boiler Works & Foundry	27
Garden City Sand Co	19
Gerlach, Peter & Co	30
Gordon Hollow Blast Grate Co	29
Grand Rapids Refrigerator Co	19
Graves Elevator Co	24
Green, H. N	22
Greiner Economical Cupola Co,	31
Haldeman & Co., N. A	22
Harrington & King Perforating Co	30
Hartford Steam Boiler Insp. & Ins. Co	31
*Hendrick Mfg. Co., Ltd	20
Hercules Powder Co	28
†Higley Sawing & Drilling Machine Co	31
Hill, Clarke Co	1
*Hodell, H. H. & Co	—
Hunt & Co., Robert W.	2
Illinois Screw Co	1
Iron Clad Paint Co	28
Jeffrey Mfg. Co	31
Jenks, James	1
Jessop & Sons, Ltd., Wm	23
Jones, E. H. & Co	32
Kilbourne & Jacobs Mfg. Co., The	2
Lake Co., J. H. & D	25
*Lake Shore Iron Works	19
Lane & Bodley Co., The	23
Lloyd Booth Co	30
Long & Allstatter Co	29
Lord, G. W	21
Lunkenheimer Co	23
Lyman, W. C	1
Magnolia Anti-Friction Metal Co	1
Milton Mfg. Co	22
Murdock, Jr., Jas	23
Northern Refrigerator Co	19
†Oak Hill Fire Brick & Coal Co	20
Oglebay, Norton & Co	30
Otto Gas Engine Co	30
Outhwaite, J. H. & Co	30
Parker, Richard A	22
Patch & Swift	22
Penberthy Injector Co	32
Pemberton, Geo	32
Pollock, Wm. B. & Co	2
Pool, F. J. & H. R	1
Pope, E. C	25
Prentiss Tool & Supply Co	30
Quint, A. P	30
Rainey, W. J	2
Richards, M. V	25
Robertson, W. H	21
Robertson, E. C	25
Robinson & Orr	2
‖Sharon Fire Brick Works	—
Skinner Engine Co	29
Spence & Son, I	2
Stevenson Bros. & Co	32
Stilwell & Bierce Co	2
Sykes Iron Roofing Co	22
Taylor & Boggis Foundry Co	1
Tod, Wm. & Co	30
Toledo Machine & Tool Co	31
*Trenton Iron Co	—
Union Electrotype Foundry	21
Union Mining Co	19
United States Heater Co	1
Upson Nut Co	30
Van Duzen Gas Engine Co	2
Vulcan Iron Works	21
Weber Gas & Gasoline Engine Co	1
Wells Engine Co	23
Westmoreland Fire Brick Co	20
Weston Engine Co	1
*Williams Bros	22

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No. 1 Bessemer hematite	3.50@ 3.75
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No 1. Specular, non-Bessemer	3.00@ 3.50

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CLEVELAND (f. o. b. cars):	
Bessemer	$11 00@$00 00
No. 1 Strong Foundry	12 00@ 13 00
No. 2 Strong Foundry	11 00@ 12 00
No. 1 Grey Forge, red short	10 25@ 10 50
No. 2 Gray Forge, neutral	10 00@ 00 00
No. 1 American Scotch	13 00@ 00 00
No. 2 American Scotch	12 50@ 00 00
Lake Superior Charcoal	15 00@ 00 00
PITTSBURG:	
No. 1 Foundry	$12 00@$12 25
No. 2 Foundry	11 00@ 11 25
Grey Forge	10 00@ 00 00
White and Mottled	9 50@ 9 75
Warm Blast Charcoal	18 00@ 19 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	10 75@ 11 00
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$15 25@$15 50
Local Coke Foundry No. 1	13 00@ 13 50
Local Coke Foundry No. 2	12 25@ 12 50
Local Coke Foundry No. 3	12 00@ 12 25
Local Scotch Foundry No. 1	13 00@ 13 50
Local Scotch Foundry No. 2	12 25@ 12 50
Local Scotch Foundry No. 3	12 00@ 12 25
Southern Coke No. 1	13 00@ 13 25
Southern Coke No. 2	11 65@ 11 90
Southern Coke No. 3	11 15@ 11 40
Southern No. 1 Soft	11 90@ 12 15
Southern No. 2 Soft	11 15@ 11 40
Southern Silveries No. 1	13 25
Southern Silveries No. 2	12 75
Southern Gray Forge	10 60@ 10 85
Ohio Silveries No. 1	14 50@ 15 00
Ohio Silveries No. 2	13 50@ 14 00
Ohio Strong Softeners	14 50@ 15 00
Alabama Car Wheel	18 00@ 18 25
CINCINNATI (reported by Rogers, Brown & Co.):	
Southern Coke No. 1, Foundry	$11 75@$12 00
Southern Coke No. 2 and No. 1 Soft	10 75@ 11 00
Hanging Rock Coke, No 1	13 25@ 13 75
Hanging Rock Charcoal No. 1, Fdy	17 50@ 18 00
Tennessee Charcoal No 1	14 00@ 14 50
Jackson County Stone Coal No 1	15 50@ 16 00
Southern Coke, Grey Forge	9 75@ 10 00
" " Mottled	9 50@ 9.75
Standard Alabama Car Wheel	17 00@ 1800
Tennessee " "	16 00@ 16 50
Lake Superior " "	17 00@ 17 50
BUFFALO (reported by Rogers, Brown & Co.)	
Mahoning and Shenango Valley, strong, No. 1 Foundry	$13 00
Mahoning and Shenango Valley, strong, No. 2 Foundry	12 50
Ohio Softener No. 1	13 00
Ohio Softener No. 2	12 75
Jackson Co. Silvery, No. 1	$16 80@ 17 30
Jackson Co. Silvery No. 2	15 00@ 16 00
Lake Superior Charcoal	15 75
Tennessee Charcoal	15 75
Southern Softener No. 1	12 75
Alabama Car Wheel	$16 50@ 17 50
Hanging Rock Charcoal	$18 50@ 20 00
LOUISVILLE (reported by Geo. H. Hull & Co.)	
Southern Coke No. 1 Foundry	$12 00@$12 50
Southern Coke No. 2 Foundry	10 50@ 11 00
Southern Coke No. 3 Foundry	10 00@ 10 50
Grey Forge	9 50@ 10 00
Spathite	12 00@ 12 50
Southern Charcoal No. 1 Foundry	13 00@ 14 00
Car Wheel	15 50@ 16 50
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$12 75@$13 00
Southern Coke No. 2	11 50@ 11 75
Southern Coke No. 3	11 00@ 11 25
Southern Grey Forge	10 50@ 10 75
Southern Charcoal No. 1	15 50@ 16 00
Missouri Charcoal No. 1	14 00@ 14 50
Ohio Softeners	16 50@ 17 00
Lake Superior	17 50@ 18 00
Southern	17 50@ 18 00
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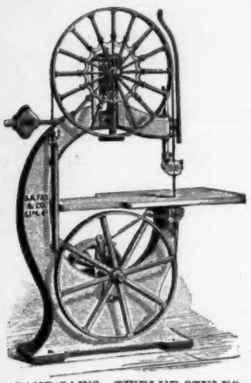
[Prices paid by mills.]

	GROSS TONS
Old iron rails	$14 00
Old steel rails	12 50
	NET TONS
No. 1 R. R. wrought scrap	$10 00
No. 1 wrought scrap	9 50
No. 1 Machine cast scrap	9 00
Iron axles	16 00
Axle turnings	9 00
Wrought turnings (free from cast)	7 00
Cast borings	5 50
Uncut wrought iron boilers	4 50
Steel boiler Plates	9 50
Grate bars	4 00
Pipes and flues (clean)	8 00
Tank iron	7 00
Hoop and band iron	6 00
Sheet iron	6 00
Wrought drillings	6 50
Malleable iron	7 50



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J. A. FAY & EGAN CO.,

251 to 271 W. Front St., CINCINNATI, OHIO.

OWNERS AND OPERATORS OF

J. A. FAY & CO. THE EGAN CO.

1835 ESTABLISHED 1873

Originators and Constructors of

WOOD-WORKING MACHINERY.

MEDALS FOR SUPERIORITY OVER ALL COMPETITORS.

350 awarded us by the various expositions in this country and abroad.

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OF ALL KINDS FOR

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PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.

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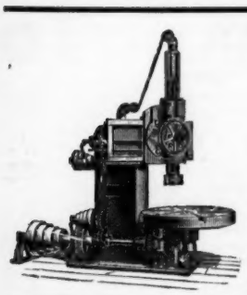
OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.



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35 Pine St., Cincinnati, O.

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MANUFACTURERS OF HIGH GRADE FIRE BRICKS.

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FROM 1 TO 40,000 POUNDS WEIGHT.

Of Open Hearth, Chester or Bessemer Steel.

True to Pattern. Sound. Solid.

GEARING OF ALL KINDS, CRANK SHAFTS, KNUCKLES FOR CAR COUPLERS.

Cross-Heads, Rockers, Piston Heads, etc., for Locomotives.

Steel Castings of every Description

CHESTER STEEL CASTINGS CO.,

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STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. mill)	1.45c@1.60c
Angles	1.45c@1.50c
Tees	1.70c@1.75c
Universal Plates	1.50c
Sheared Plates	1.60c

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 60
4¼ to 6 by ⅜ to 1 inch	1 65
1¾ to 6 by 1⅛ to 2 inch	1 80
1¾ & 1¾ by ⅜ to ¾ inch	1 65
1 & 1⅛ by ⅜ to ¾ inch	1 70
⅝, ¾, ⅞, by ⅜ to ¾ inch	1 80

Round and Square.

1 to 1⅞ inch	1 60
2 to 2⅝ inch	1 70
2¾ to 3¾ inch	1 85
3⅜ to 4 inch	2 10
4¼ to 4½ inch	2 79
4¾ to 5 inch	2

Oval.

⅞ to 1¼ inch	1 80
⅝ to ¾ inch	1 80
½	2 00
⅜	2 20

Half Oval and Half Round.

1½ to 3 inch	2 15
⅞ to 1½ inch	1 95
⅝ to ¾ inch	2 20
½	2 35
⅜	3 45

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	1 70
1 to 1¾ by ¼ and 5-16 inch	1 75
¾ to ⅞ by ¼ and 5-16 inch	1 85
½ to ⅝ by ¼ and 5-16 inch	2 10

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	2 15
1 7-16 to 2, No. 17, 18 and 19	2 20
1 7-16 to 2, No. 20	2 30
1 7-16 to 2, No. 21	2 40
1 7-16 to 2, No. 22	2 50
1⅛ to 1⅜, No. 13, 14 and 15	2 20
1⅛ to 1⅜, No. 16, 17 and 18	2 25
1⅛ to 1⅜, No 19 and 20	2 30
1⅛ to1⅜, No. 21	2 40
1⅛ to 1⅜, No. 22	2 50
15-16 and 1 inch, No. 13, 14 and 15	2 25
15-16 and 1 inch, No. 16, 17 and 18	2 30
15-16 and 1 inch, No. 19 and 20	2 40
15-16 and 1 inch, No. 21	2 50
15-16 and 1 inch, No. 22	2 60
⅞, No. 13, 14 and 15	2 40
⅞, No. 16. 17 and 18	2 50
⅞, No. 19 and 20	2 60
⅞, No. 21	2 70
⅞, No. 22	2 80
13-16, No. 13, 14 and 15	2 50
13-16, No. 16, 17 and 18	2 60
13-16, No. 19 and 20	2 70
13-16, No. 21	2 80
13-16, No. 22	2 90
¾, No. 13, 14 and 15	2 60
¾, No. 16, 17 and 18	2 75
¾, No. 19 and 20	2 85
¾, No. 21	2 95
¾, No. 22	3 65
11-16, No. 13, 14 and 15	2 85
11-16, No. 16, 17 and 18	2 90
11-16, No. 19 and 20	3 00
11-16, No. 21	3 10
11-16, No. 22	3 20
11-16, No. 23	3 30
⅝, No. 13, 14 and 15	2 90
⅝, No. 16, 17 and 18	3 00
⅝, No. 19 and 20	3 10
⅝, No. 21	3 20
⅝, No. 22	3 30
⅝, No. 23	3 40
9-16, No. 13, 14 and 15	3 10
9-16, No. 16, 17 and 18	3 20
9-16, No. and 20	3 30
9-16, No. 21	3 40
9-16, No. 22	3 50
9-16, No. 23	3 60
7-16 and ½ inch, No. 13, 14 and 15	3 30
7-16 and ½ inch, No. 16, 17 and 18	3 40
7-16 and ½ inch, No. 19 and 20	3 50
7-16 and ½ inch, No. 21	3 60
7-16 and ½ inch, No. 22	3 70
7-16 and ½ inch, No. 23	3 80
⅜, No. 13, 14 and 15	3 80
⅜, No. 16, 17 and 18	3 90
⅜, No. 19 and 20	4 00
⅜, No. 21	4 30
⅜, No. 22	4 40
⅜, No. 23	4 55

Light Band.

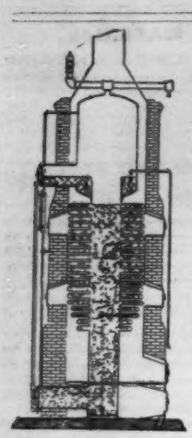
1¼ to 6 by ⅛ to 3-16 inch	1 90
1¼ to 6 by Nos. 11 and 12	1 95
1 to 1¾ by ⅛ to 3-16 inch	1 95
1 to 1¾ by Nos. 11 and 12	2 00
⅞ and 13-16 by ⅛ to 3-16 inch	2 10
⅞ and 13-16 by Nos. 11 and 12	2 15
¾ and 11-16 by ⅛ to 3-16 inch	2 20
¾ and 11-16 by Nos. 11 and 12	2 25
⅝ and 9-16 by ⅛ to 3-16 inch	2 35
⅝ and 9-16 by Nos. 11 and 12	2 40
½ by ⅛ to 3-16 inch	2 50
½ by Nos. 11 and 12	2 55

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 10
⅞ inch, " " " " 13 and 14	2 20
¾ inch, " " " " 11 and 12	2 25
¾ inch, " " " " 13 and 14	2 45

Sheet Iron.

No. 10	2 15
No. 12	2 20
No. 14	2 25



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WATER TUBE BOILER.

This Boiler is absolutely safe from explosion. Gives as much steam from the waste heat as any boiler made. Easy of access for cleaning and repairs. Furnishes perfectly dry steam. Occupies little ground space. Economical in first cost. Send for complete circulars giving list of users and testimonials, one of which is printed below.

The Falcon Tin Plate & Sheet Co., }
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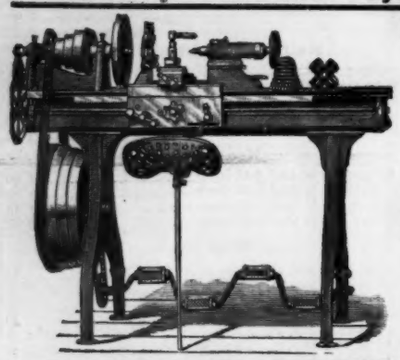
Chas. P. Adams, Esq.

Dear Sir: The three boilers of 225 H. P. each which you furnished us are working in every way satisfactory. We consider them as good steamers as any we have ever used. Up to the present time have spent nothing on them for repairs. Very respectfully,

THE FALCON TIN PLATE & SHEET CO.,
By Warner Arms, Pres't.

C. P. ADAMS.
807 The Cuyahoga, .- CLEVELAND. O.



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For Electrical and Experimental Work.
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High grade Tools; correct in principle, elegant in design, superior in construction. THE BEST FOOT-POWER LATHES MADE. Send for catalogue and prices.

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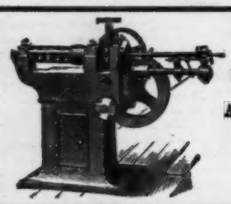

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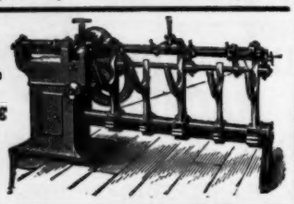
Builders of Machinery for Hardware Manufacture.

Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Screw Cutters, Etc.



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And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

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HERCULES,
THE GREAT STUMP AND ROCK
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SEND FOR DESCRIPTIVE PAMPHLET.

Stump before a blast. | Fragments after a blast.

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POWDER, FUSE, CAPS,
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AND ALL TOOLS FOR STUMP BLASTING,
FOR SALE BY THE
HERCULES POWDER COMPANY,
40 Prospect Street, Cleveland, Ohio.
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No. 15-17	2 35
No. 18	2 50
No. 20	2 60
No. 22-24	2 70
No. 25 26	2 80
No. 27	2 90

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 60
Shell	2 25
Flange	2 50
Marine Flange	2 75
Fire Box	3 75

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. ℔. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1¼c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s.
1 to 2 in, inclusive	08
9-16 to ½ in. "	08½
7-16 to ⅜ and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅜ to 11-16 and 4½	10
⅝ to 6 in	10½
¼ to 9-32 and 6¼ to 7 in	11
3-16 in	13

Flats.

	cts. ℔s.
2 to 9-16 in. wide by 2 to ⅛ thick	8

Bessemer and O. H. Steel.

Machinery	base price, 2 10
Tire	" 2 25
Spring	" 2 50
Sleigh Shoe	" 2 50
Toe Calk	" 2 35
Cutter Shoes, tapered and bent	" 2 75

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 80
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 50

MACHINERY SUPPLY MARKET.

Anvils.

American	℔ 9@10
Wright's	℔ 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 45
Munson's Short Lap Double and Light Double Leather	dis 50
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis 45

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 30
Horton's Universal	dis 40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	℔ 3½
Iron, steel points	℔ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F. F, FF.
Kegs, ℔	4½c	5 c	2½c
½ kegs ℔	4¾c	5¼c	2¾c
¼ kegs ℔	5 c	5½c	3 c
10 ℔ cans, 10 in case	6 c	6½c	5 c
10 ℔ cans less than 10	10 c	10 c	7½c

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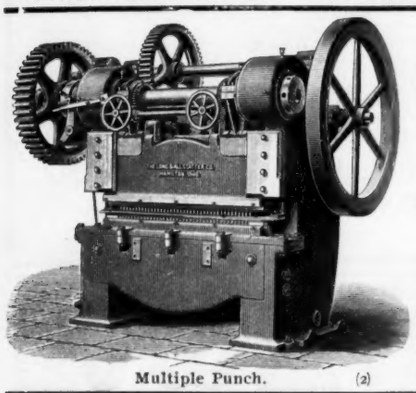

Multiple Punch. (2)

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Long & Allstatter Co.

HAMILTON, O., U. S. A.

Manufacturers of Belt, Steam and Electrically driven

Power Punches and Shears,

for all kinds of Boiler, Tank and Structural Iron Work, Rolling Mills, Locomotive Shops, Car and Wagon Shops, Plow Shops, etc. Send for catalogue.

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11 BRIDGE ST., RACINE, WIS.

MANUFACTURERS OF

Standard Tubular, Fire Box, Vertical and Submerged Tube Steel

BOILERS

For **Marine, Stationary,** or **Portable** use.

ALSO OF

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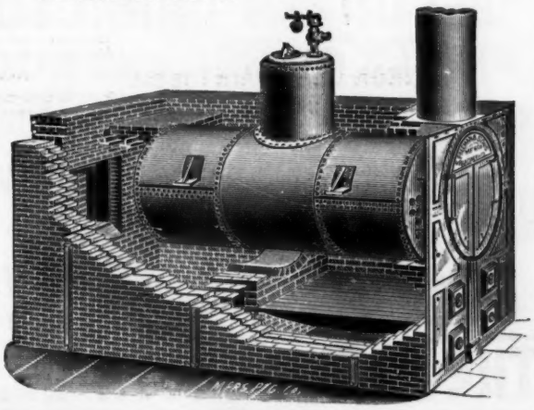
OF ALL KINDS.

Smokestacks, etc., - - - - Grey Iron Castings.

Write for Prices and Terms.



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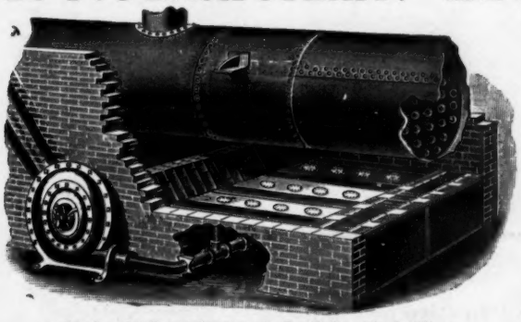

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Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 60&10
Hamden.....dis 60&10
Cyclone.....dis 60

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....15c
" " " " over 5 lbs.....12c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3½
Hexagon	15½	11½	8½	6	5¾	5¼	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887.....dis 75
Standard Penny Nails, ₩ keg card rate
{ Car lots.....$1.55
{ Less than car lots...$1.65

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 9@10
Russia " " .....₩ lb 14
Italian " " .....₩ lb 13@19
Plumbago Piston.....₩ lb 40
Peerless.....₩ lb 60
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48
Rainbow.....{ Full Rolls.....45c ₩ lb
{ Less than Full Rolls. 50c ₩ lb
Eclipse Gasket.....₩ lb 75

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 40
Medart Pulleys.....dis 50
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17.....dis 50&10@60
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50&10@60
Copper.....dis 50@50&10

Saws.

Disston's Circular.....dis 40&10
" Band.....dis 25
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Diston's.....dis 30
Atkins' Circular Saws.....dis 40&45
" Mill, Mulay and Drag Saws.....dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....70c per ft
" Dexter Cross-cuts.....50c "
" Diamond " .....30c "
" Tuttle Tooth Cross-cuts.....25c "
" One-man Cross-cuts.....32c "
No. 1 Handles.....23c per pair
No. 6 " .....16c "
Excelsior Saw Tools.....$6 per doz
Derfection " .....$15 "
Petroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Jan. 18, 1884

Brass	dis 30
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ lb dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

Bolt and Nut Works.

THE UPSON NUT CO., Manufacturers of Nuts, Washers, Carriage, Machine, Plow and Elevator Bolts, Coach Screws, etc.

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AND METALS.

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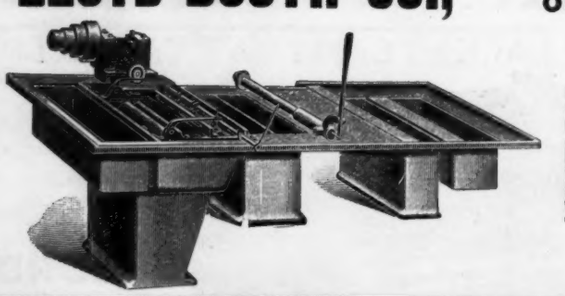

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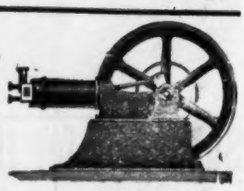

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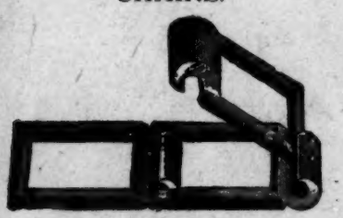

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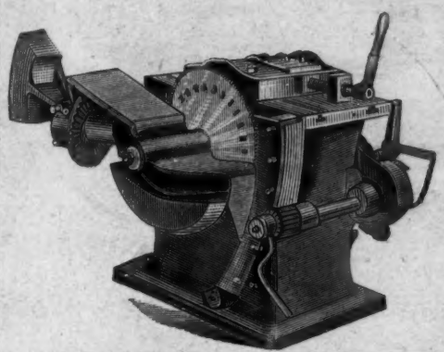

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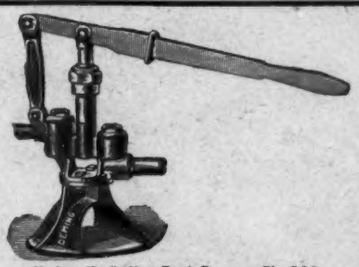

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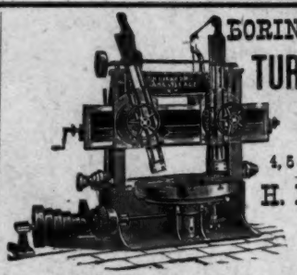

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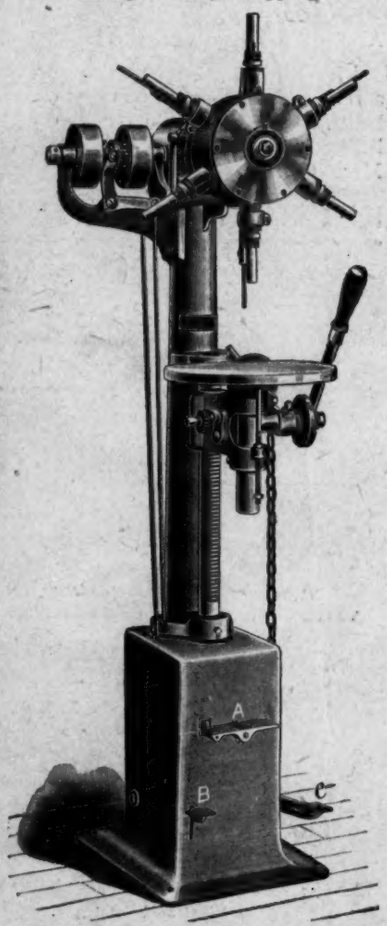

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